Mining CONGRESS JOURNAL

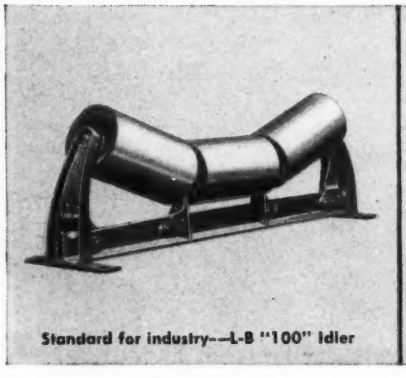
MARCH 1951

LINK-BELT engineering experience...

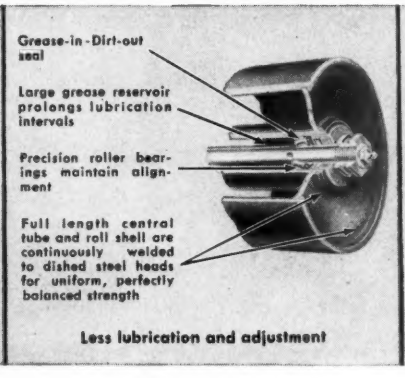
Nickel ore enroute to bin.

Overburden leaving iron ore pit.

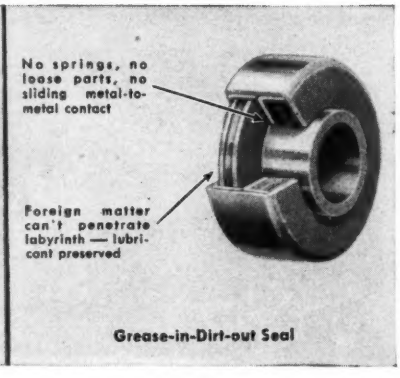
LINK-BELT quality components...



Standard for industry—L-B "100" Idler



Less lubrication and adjustment



Grease-in-Dirt-out Seal

add up to your best bet in BELT CONVEYORS

In mines all over the world, LINK-BELT Belt Conveyors provide reliable, efficient materials handling

Get the finest in modern materials handling in your mine. It can be as simple as calling in a Link-Belt engineer while you're still in the planning stage.

Thousands agree Link-Belt builds the finest belt conveyors on the market today. More, it has the most complete line of components — all types and sizes — idlers, take-ups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers, weigh larries.

Equally important, Link-Belt Belt Conveyor engineers can draw on the broadest materials handling background in the industry. They'll work with you and your consultants — help you come up with the right system for your requirements.

Call on your representative, or write us direct for the services of a belt conveyor expert.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities.

12.247-A

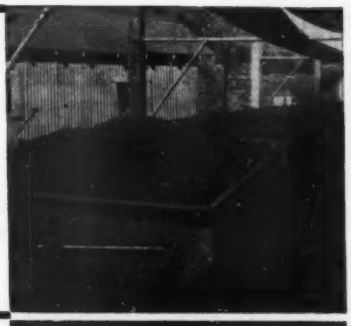
THE S-D "FLOATER"...

America's No. 1 Mine Car Wheel!

"FLOATERS"

FOR FASTER . . . CHEAPER HAULING

Independent engineering firm tests prove that locomotives can pull up to 50% greater loads with no additional power requirement when cars are equipped with S-D "Floaters" instead of other types of precision bearing wheels . . . a big power and time saver!



"FLOATERS"

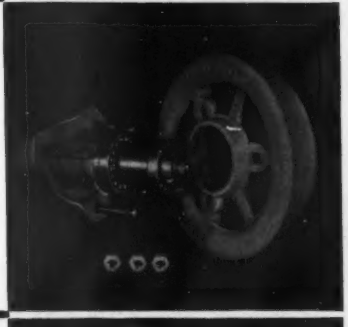
FOR LESS MAINTENANCE . . .

With "Floater's" solid closed front hub, and back double seal, grease stays in the wheel, dust and dirt stay out. Often "Floaters" require greasing no more than once in five years.

"FLOATERS"

FOR QUICK DEMOUNTABILITY

Any unskilled worker can remove and replace a "Floater" as easily as changing an automobile wheel. Bearings always remain in perfect adjustment on axle. When replaced there's no chance of pinching, misalignment, loose or tight bearings.



"FLOATERS"

FOR LONGER WHEEL LIFE

We believe our own special mixture of iron and exclusive heat treatment are responsible for making "Floaters" famous for their toughness and long wear . . . such quality is your assurance of perfect satisfaction.

Try S-D "Floaters". Check their savings. Experience proves that once an operator knows what "Floaters" will do for him, he specifies smooth-running "Floaters" for all wheel replacements. For complete information, write Sanford-Day Iron Works, Knoxville, Tenn.

SANFORD-DAY IRON WORKS

as 1-2-3 to Order

DRAGLINES

ONE, length . . . TWO, diameter . . . THREE, the name "Tuffy." That's all the information you need to order Tuffy Draglines—and get all the extra advantages of this tougher, stronger wire rope. No complicated specifications . . . no time-wasting, detailed forms to fill out.

Made for Extra Yardage . . . Extra Service

Ask the men who have used Tuffy Draglines about Tuffy's yardage and service. You'll find convincing proof that Tuffy actually handles *more* yardage—at a *lower* ultimate cost—and gives *longer* service on the job. Here's why Tuffy gives you these extra advantages:

EXTRA FLEXIBILITY. Wires of the finest steel in a construction designed for universal dragline service, gives Tuffy Draglines the extra flexibility needed without sacrificing other qualities.

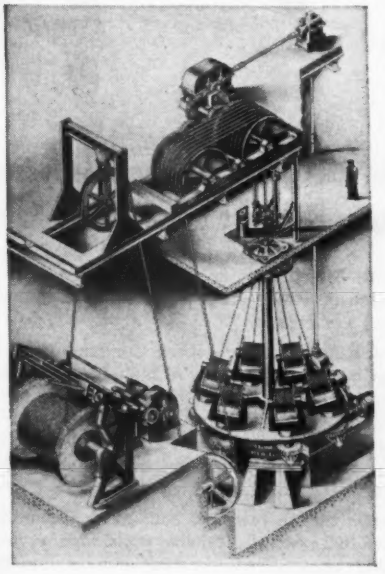
MAXIMUM ABRASIVE RESISTANCE. Obtained by finer technic in construction with materials toughened to withstand more abrasive wear.

EASY TO HANDLE. It's pliable. Tuffy Draglines spool better and ride better on grooves.

HUGS DRUM WHEN CASTING. Jerking, pulling and bending stresses do not distort its pliable construction.

Put Tuffy Dragline to the test on one piece of your equipment. Compare it for length of service and yardage with other wire rope draglines. You'll see why so many operators standardize on Tuffy Draglines for their whole operation.

THIS GIANT MACHINE TURNS OUT 27 TONS OF UNION WIRE ROPE IN ONE CONTINUOUS LENGTH



It stands 4 stories high . . . has capacity for laying rope from ¾" to 4" in diameter. This massive closing machine in Union Wire Rope's modern plant is used in the production of Tuffy Draglines, boom ropes, boom support ropes, hoist ropes, crowd and retract ropes, counterweight ropes, holding and closing ropes, and other specialized wire rope for mining.

Send For These Folders Today

See how you can cut operating costs . . . reduce downtime . . . gain longer, better performance with Tuffy Wire Ropes for mining. Mail coupon today.

UNION WIRE ROPE CORPORATION
Specialists in Wire Rope
2144 Manchester Ave. Kansas City 3, Mo.

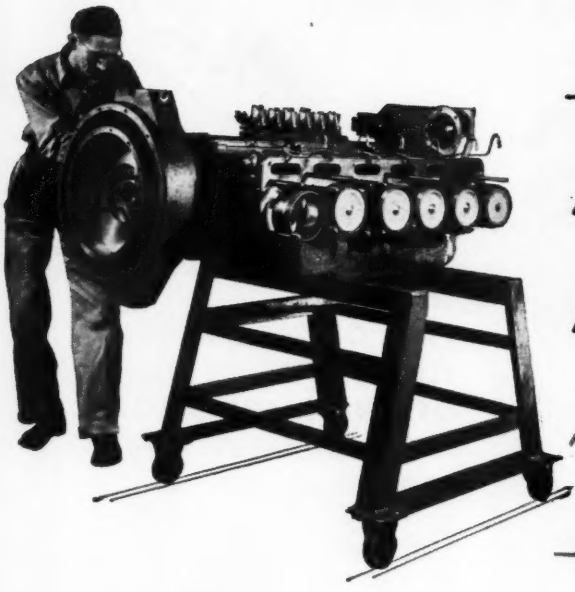
Please send illustrated folder on: ☐ Tuffy Slusher Ropes ☐ Tuffy Mining Machine Ropes ☐ Tuffy Slings. ☐ Tuffy Draglines

Firm Name_____

Address_____

City_____ Zone____ State_____

Cummins® Custom-built Diesels



Built not once but Twice

Best buy in power is the engine that's built best

Cummins Diesels have an outstanding record *and* reputation in a wide range of Diesel applications. And here's one reason!

Rugged, lightweight, high-speed Cummins Diesels perform better because they're built better, under strictest quality control methods. Moreover, each engine is actually built twice! After initial assembly, each engine is run in on the test block. Then it is torn down and carefully re-inspected — and after that it is re-assembled and tested *again*.

Such *extra* care in precision building . . . Cummins exclusive fuel system . . . reliable world-wide service and parts organization . . . enable Cummins users to get peak performance . . . less "down-time" and *more* rugged, dependable power.

Better contact your Cummins dealer. He has more facts to show you about making more profits.

Diesel power by CUMMINS

CUMMINS Dependable DIESEL

TRADEMARK REG. U.S. PAT. OFF.

CUMMINS ENGINE COMPANY, INC. • COLUMBUS, IND.

EXPORT: CUMMINS DIESEL EXPORT CORPORATION
Columbus, Indiana, U. S. A. • Cable: Cumdiex

Lightweight High-speed Diesel Engines (50-550 hp) for: On-highway trucks • off-highway trucks • buses • tractors • earth-movers • shovels • cranes • industrial locomotives • air compressors logging yarders and loaders • drilling rigs • centrifugal pumps generator sets and power units • work boats and pleasure craft.

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Contents

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THE AMERICAN MINING CONGRESS
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HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — ANDREW FLETCHER, *Vice President* — WILLIAM J. JENKINS, *Vice President* — JULIAN D. CONOVER, *Secretary*

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ABC
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UNDERGROUND, OR . . . .

IT'S JOY EQUIPMENT

Right: The Joy Drillmobile, a twin-boom, self-propelled, highly maneuverable machine, gives you maximum footage at least cost per foot of hole. Features Joy Hydro Drill Jibs for fast, accurate hole-positioning, and remote control.

Above: For high-production loading and haulage of rock and ore, Joy teams of trackless loaders and electric or diesel shuttle cars get the call underground.

Right: Complete range of Joy Stopers includes the new S-91T, with telescopic feed. Requires fewer steel changes, gives more time for drilling.

Below: Joy Wagon Drill specially adapted to drill at any height from toe-holes to horizontals 9' high.

Left: The Joy HS-15 high speed drill for underground blast holes, or core drilling to 500'. Compact and easy handling, with "in-line" vibrationless drive.

Below: Joy Hydro Drill Jibs are versatile units; can be mounted as required to suit individual needs. This truck-mounted Jib is an example.

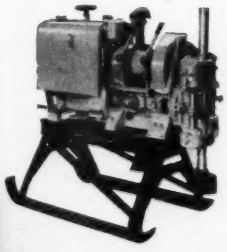
. . . . ON THE SURFACE

FOR GREATER TONNAGE
FOR LOWER COSTS

Above: Joy builds a complete line of "Silver Streak" Hand Tools, cadmium-plated for rust protection and easier running in.

Above: Joy Wagon Drills (Medium and Lightweight models) are easily maneuvered units with positive locking brakes for quick set-ups and balanced drilling on any terrain.

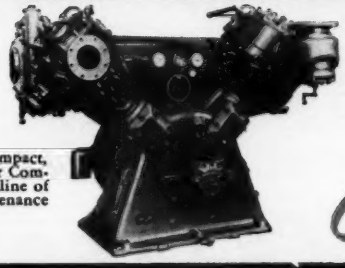
Above: Joy Champion Rotary Drills set absolutely new standards in high-speed, economical blast hole drilling, far outperforming all others. Built in two self-propelled models, for diesel, gasoline engine or electric motor drive.



Above: Joy Core Drills range in capacity from 250 to 1750 feet of 1½" hole. Screw feed or hydraulic types—gasoline, diesel, air or electric drive.

Left above: Joy's popular Series 80 Portable Compressors, with the famous "Econo-Miser" load control, are built in seven sizes, from 60 to 630 CFM.

Above: Joy Hydro Drill Jibs are readily adaptable to truck-mounting, etc. for secondary drilling or toe-holes in quarries or open-cut mining.



Right: Joy pioneered the compact, modern "package-type" Air Compressor—offers a complete line of highly efficient, low maintenance airplants up to 3656 CFM.

Consult a Joy Engineer

WAD M-3363

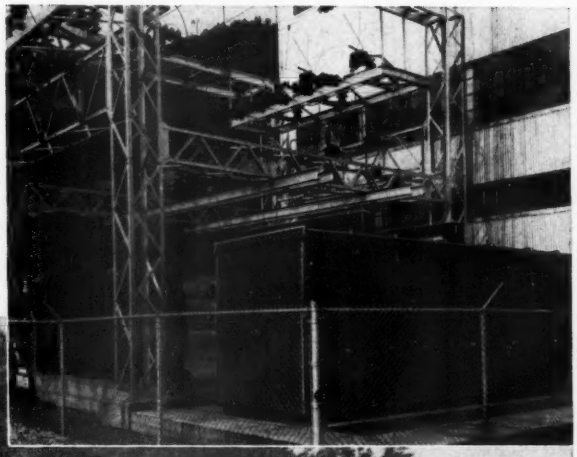
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

Electrically co-ordinated to keep clean-coal output at 750 tons per hour!

New Price mine and preparation plant rely on General Electric equipment to maintain high operating efficiency

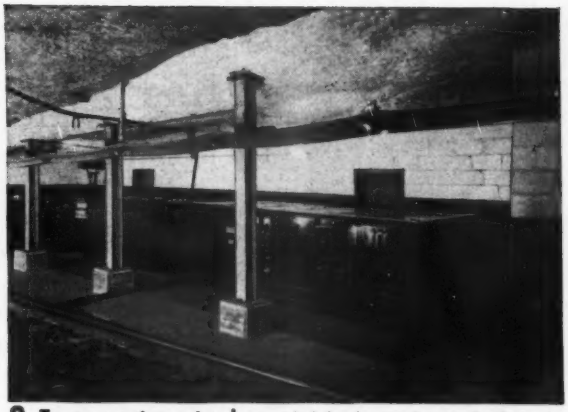
Completed in May, 1950, the Price Mine preparation plant of the Inland Steel Co. at Wheelwright, Ky., makes extensive use of co-ordinated General Electric equipment to minimize outage and maintenance delay, keep clean-coal output at rated capacity of 750 tons per hour. Here, ash and other impurities in the mined coal are removed to provide a high grade metallurgical coal, uniformly low in ash, for making coke. A 3000-kva G-E package substation—including transformers and switchgear—contains all equipment needed to step down incoming 44,000-volt power and distribute it at 480 volts to power the plant's motors.



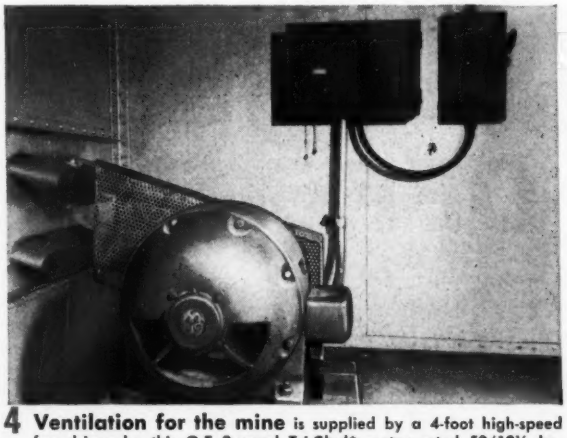
GENERAL ELECTRIC

663-14

2 To haul coal from the underground assembly yard to the preparation plant over a 5-mile haulageway, 6 G-E 15-ton high-speed haulage locomotives are used, fully equipped with air brakes and air sanding, and controlled by air-operated contactors. Efficient, powerful, fast and safe, each locomotive makes 5 to 6 round trips per 7½-hour shift, handles 60 cars, each of 43¾ tons total gross weight.

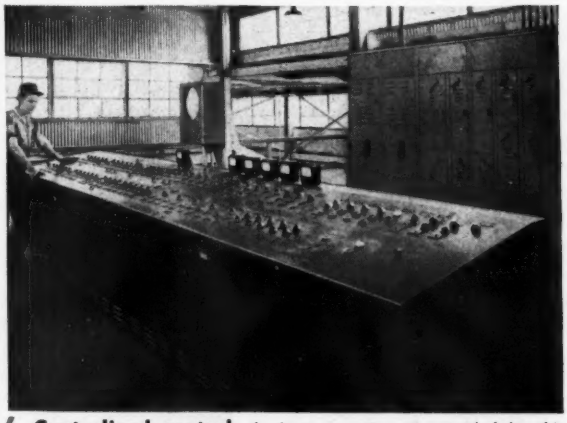


3 To convert a-c to d-c needed for locomotives and other mining machinery, two G-E 300-kw 275-volt d-c rectifiers are used, one stationary and one portable. High in conversion efficiency, these units are easily installed, give high service continuity with minimum maintenance, and are metal-enclosed to protect personnel. Portable type shown is easily relocated to give near-full voltage at the face for more efficient machine operation, and to eliminate long, expensive d-c cable runs.



4 Ventilation for the mine is supplied by a 4-foot high-speed fan driven by this G-E 2-speed Tri-Clad* motor rated 50/12½ hp, 1175/585 rpm, 440 volts. Tri-Clad motors—with 3-way extra protection built in against physical damage, electrical breakdown, and operating wear and tear—are available in enclosures for every mining use. G-E automatic 2-speed control above motor protects fan against single-phase operation, overload, and other possible interruptions to this vital operation.

5 From the washers, after cleaning, ¼" x 0 coal is fed into 6 centrifugal dryers (four shown) driven by G-E wound-rotor motors rated 150 hp, 900 rpm, 440 volts. Plant uses a total of about 3600 horsepower. And with dependable G-E motors and control co-ordinated into a smooth-running, efficient, and low-maintenance operation, each step in the preparation process dovetails with all other steps, minimizing production slowdowns, maintaining high service continuity.



6 Centralized control of plant operations is provided by this G-E main control desk. Push buttons, selector switches and indicating lights are all conveniently combined and centralized at one location, to co-ordinate operations closely, make most efficient use of manpower. G-E Cabinetrol* unit in background, one of several located at control points, contains switch and fuse combination starters, plus interlocks and timers to provide sequence operation.

Registered trade mark of General Electric Co.

7 All G-E equipment for this mine was supplied on a G-E project co-ordination basis. Find out how this plan can simplify your ordering, save your time, help your consulting engineers and contractors to provide a co-ordinated system to meet your needs. Ask your G-E representative to tell you all about this plan, and send for Bulletin GEA-5308, a 32-page photo report on how G-E is benefiting typical preparation plants. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

MULTI-USE. Gives lowest cost per foot of hole when full increments of drill steel can be drilled and when control and reconditioning of bits are correct.

CARBIDE INSERT. For drilling extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

ONE-USE "SPIRALOCK". To use where reconditioning is not feasible. Gives lowest unit cost. "Spiralock" union holds bit on dependably, permits easy removal.

ONLY THE TIMKEN COMPANY OFFERS:

1. *All 3 rock bit types . . .*

2. *A complete Rock Bit Engineering Service*

No matter which type of removable rock bit is best for your particular job, you can get it from the Timken Company! For *only* the Timken Company *makes all three rock bit types*—multi-use, carbide insert, and one-use "Spiralock". And *only* the Timken Company can offer you the world's largest field engineering organization devoted exclusively to rock bit problems.

Our Rock Bit Engineers have more than 18 years of field and laboratory experience behind them, and with all three rock bit types to choose from, they'll help you make an unbiased selection of the *one* best bit for your job.

Whether you're looking for lowest bit cost, lowest cost per foot drilled, greatest possible drilling speed, or any other desired advantage, call on us to get the kind of bit performance you're after. For information and help, contact The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit ... for every job

FREE BOOKLET! *Packed with helpful information. Shows full line of bits with detailed descriptions. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".*

Big and Strong... Better than Ever...

MARION 111-M

Machine illustrated has Diesel power with electric swing. Also available as full Ward-Leonard Electric machine.

MARION gave the industry a new conception of excavating equipment in 1946 when the MARION 111-M was introduced. Here was a 3½-4 cu. yd. machine with all of the benefits of Diesel power PLUS all of the advantages of electric swing. Big enough for high daily yardage, yet easily moved from one job to another. Power enough to stand up to big jobs without flinching. Heavy enough to be steady on its long, wide crawlers.

Now—the MARION 111-M is bigger and stronger—better than ever. It is a thoroughly field-proven machine, piling up performance records that are truly impressive. (Write for copies of letters from 111-M owners.)

Regardless of whether you have seen the MARION 111-M before, you should see it today if a 3½-4 cu. yd. machine has a logical place in your operations. It's a rugged, heavy machine as a shovel or dragline with power and strength to spare.

The 111-M is an important new tool for heavy-duty material handling. Get the full story from your MARION representative or write to the factory for information.

MARION

POWER SHOVEL COMPANY

MARION, OHIO, U.S.A.

Offices and Warehouses in all Principal Cities • Established 1884

You get better breakage with Du Pont "MS" Caps...

Less vibration, greater safety, too!

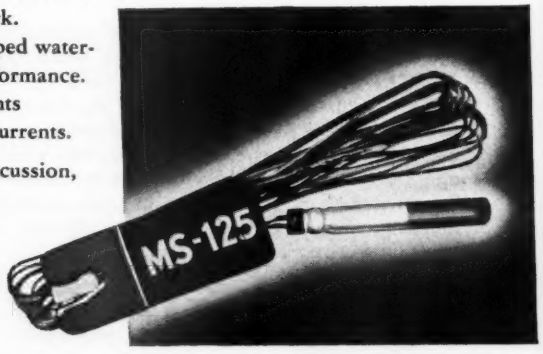
More and more mine operators are switching from the use of caps and fuse to "MS" Delay Electric Blasting Caps* because they provide superior fragmentation, greater safety and less vibration.

Even badly fractured veins break well when "MS" Delay Caps are used. And uniformly fine breakage makes slusher operation more efficient . . . reduces costly hand labor and secondary blasting.

Workers find "MS" Delay Caps as safe as they are efficient. Because of their short interval they leave no dynamite in the muck. Brightly colored nylon-insulated wires and double-crimped water-resistant rubber-plug closures make for dependable performance. Protective Cellophane-lined aluminum-foil-shielded shunts greatly reduce the risk of premature firing due to stray currents.

"MS" Delay Caps substantially reduce vibration and concussion, too. This results in less damage to pillar walls.

Get complete information about "MS" (millisecond) Delay Electric Blasting Caps today. Talk to your Du Pont Explosives representative or write: E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.



**Available in 14 millisecond intervals of delay: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450 and -500.*

DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

WIRE ROPE

Roebling rope is the A-1 specification in the mining fields

FOR EASY HANDLING, extra toughness and service life, there's nothing like Roebling Preformed "Blue Center" Steel Wire Rope. "Blue Center" steel—made only by Roebling—gives rope top resistance to abrasion and fatigue. And Roebling Preforming gives you a rope that spools better... doesn't tend to set or kink... minimizes vibration and whipping.

There is a Roebling wire rope of the right construction, grade and size for every type and make of rope-rigged equipment. Have your Roebling Field Man help choose the rope that will give you the best, low-cost performance. Further savings may be effected by following his suggestions on installation, use and maintenance of wire rope. John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

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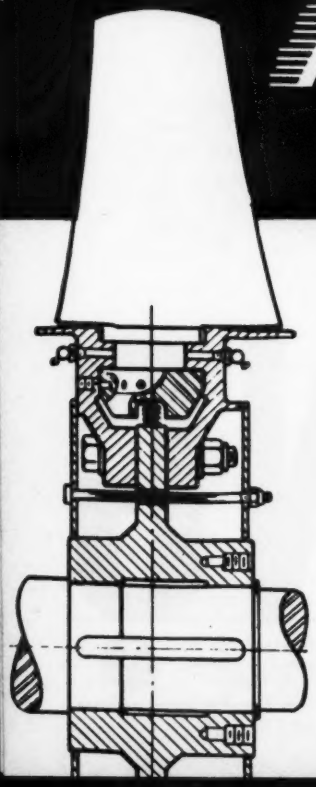
IT'S EASY

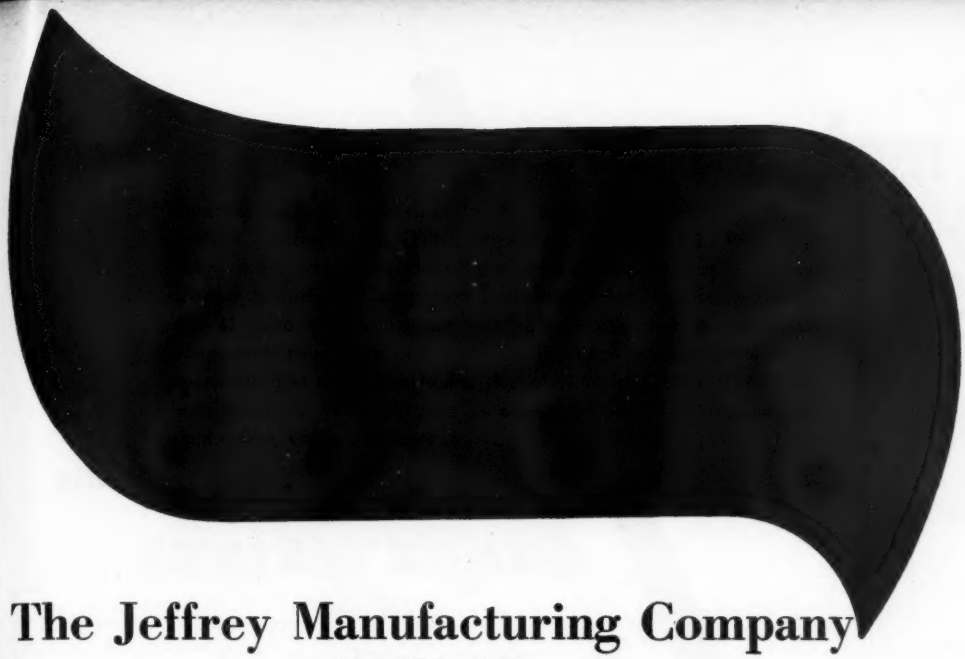
TO CHANGE BLADE POSITIONS ON THE JEFFREY AERODYNE MINE FAN



Easy blade adjustment is one of the important features of the Jeffrey AERODYNE Fan. The rotor is assembled with 12 blades designed for *individual* adjustment. Positive, accurate adjustment is made by removing one set screw in each blade, rotating the blade to desired position and re-inserting the set screw.

Ease of changing position is facilitated by providing stainless steel thread inserts in each screw hole of the socket, plus the use of rust-proof set screws. In addition, lubrication fittings are supplied on both halves of the socket to eliminate seizure between the blade and socket due to corrosion and dirt particles getting into space between blades and sockets. A large number of positions are available for an extremely wide range of operation.

Consult a Jeffrey Engineer both on fan and blower applications for your mine.



- Bin Valves
- Bucket Elevators
- Car Pullers
- Chains
- Conveyors
- Coolers & Dryers
- Coal Cutters
- Crushers
- Drills
- Feeders
- Fans & Blowers
- Idlers (Belt)
- Jigs
- Loaders
- Locomotives
- Magnetic Separators
- Pulverizers
- Screens
- Shuttle Cars
- Transmission Mach'ry

The Jeffrey Manufacturing Company

(Founded in 1877)

958 North Fourth Street, Columbus 16, Ohio

"AERODYNE"
(Reg. U. S. Pat. Off.)

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Birmingham 3	Cincinnati 2	Harlan, Ky.	New York 7	St. Louis 1
Boston 16	Cleveland 15	Houston 2	Philadelphia 3	Scranton 3

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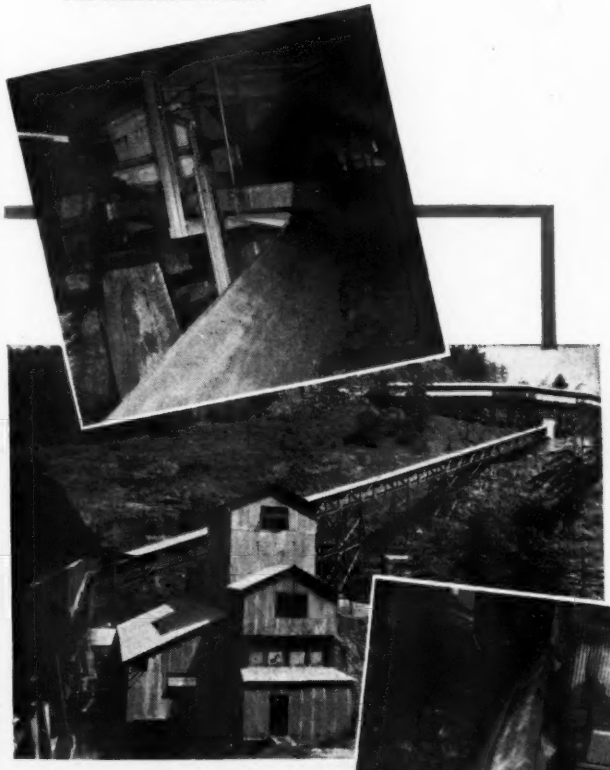
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio
The Galion Iron Works & Mfg. Co., Galion, Ohio

Above ground, too...

Reliance PRECISION-BUILT Totally-enclosed, Non-ventilated A-c. Motor.

RELIANCE
Precision-Built
MOTORS

do a *Good* Job on the *Tough* Jobs!



Reliance two-speed motor (top) effectively regulates volume of coal passed by eccentric feeder onto decline conveyor (right). Movement of conveyor with 12-ton load is controlled by Reliance two-speed motor with integrally mounted brake.

Wherever coal is mined, more and more operators are discovering that Reliance PRECISION-BUILT A-c. Motors provide the maximum in dependable and economical power on every job above and below ground.

These rugged, long-lived motors applied to shaking and vibrating screens, washers, pumps, air tables, crushers, feeders and conveyors will offer you invaluable assistance in keeping production up and costs down. PRECISION-BUILT Motors are made in all standard enclosures, in sizes from 3/4 to 300 hp. Write today for Bulletins B-2101 and B-2201. For Explosion-Proof Motor data ask for Bulletin C-130.

Sales Representatives in Principal Cities

RELIANCE ELECTRIC AND ENGINEERING CO.

"All Motors are NOT Alike" • 1116 Ivanhoe Road, Cleveland 10, Ohio

A special 2¼-yd. coal loading dipper is available for the fast, dependable 38-B shown here. Standard dipper is 1½-yd.

Stand-Out On the Coal Seam

BECAUSE they load fast and load big . . . because they stay on the job year after year for dependable output . . . because they're easy on the operator and low on operating and maintenance costs — these are some of the reasons why Bucyrus-Eries are such outstanding performers on coal seams all over the nation. Experienced Bucyrus-Erie design provides the balanced speeds and power that mean a fast, smooth cycle. Careful laboratory control of materials puts strength and durability into every part. Simple, easily accessible machinery means less time out for servicing and maintenance. Your Bucyrus-Erie distributor has full information on ⅜- to 4-yard gasoline, diesel and single-motor electric excavators. See him for complete details.

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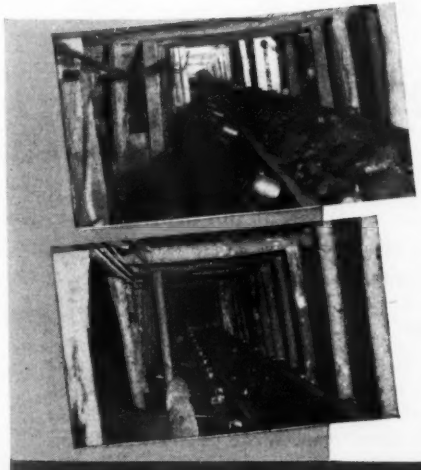
Speed up your gathering and transporting with *Goodman* TROUGHED BELT CONVEYORS

Quickly installed... extended... relocated

For short runs . . . long hauls . . . for heavy duty service — *wherever a belt conveyor can be used in a coal mine* — there's a Goodman unit exactly right for the job. Every one of them is designed for fast, easy assembly. All of them provide dependable, continuous transportation that means more tonnage at lower cost.



97-C SERIES, TANDEM DRIVE — Suitable for motors up to and including 75 hp. Head and tail ends vary in size to best meet requirements of horsepower, conveyor length and capacity. An important feature is the hook and button style of construction which speeds up assembly, extension or relocation. Intermediate sections, 8 ft. in length, are interchangeable. "Knockdown" design facilitates handling.

97-CS SERIES, SNUB DRIVE — Latest addition to the Goodman line. They are designed for motors up to a maximum of 20 hp. and feature a short, lightweight head section with an over-all height of only 33". Because they are small and utilize the same easy-to-handle, easy-to-assemble intermediate sections as those in the 97-C series, they are especially adaptable to low coal where frequent move-ups are required.

99 SERIES, TANDEM DRIVE — These conveyors feature rugged construction suitable for the faster speeds and higher power required for surge loading or main hauls. Component parts are easily handled, permit quick assembly and compact storage. Intermediate sections are interchangeable, and their method of assembly assures correct alignment. Motors up to 75 hp. can be used.

Your inquiry for details regarding any Goodman belt conveyor is invited. Write today and get the latest on the newest in belts.

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Be sure to see Goodman machines in operation. Meet us at spaces 2343 and 2443

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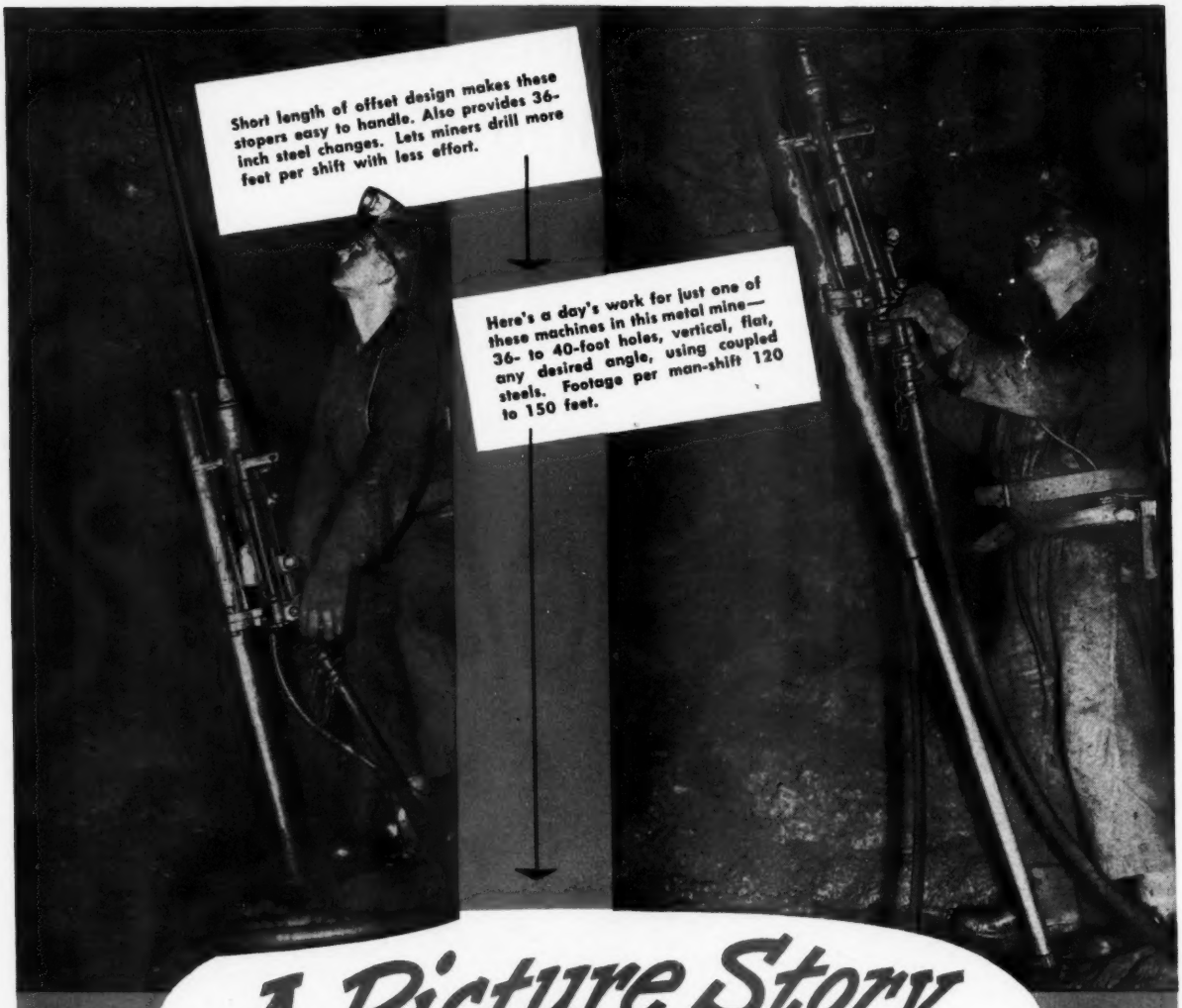

A Picture Story of Lower Stoping Costs

. . . shows how Le Roi-CLEVELAND offset stopers drill extra footage, save you money

Take a good look at these pictures. Note the length of the drill steel. Fitted with carbide-tipped bits, it gives you 36" of drilling—3 feet with every change.

That's one of the reasons why Le Roi-CLEVELAND offset stopers are paying off in lower drilling costs.

But it's not the whole story. The machines shown here are equipped with downstroke rotation. This gives plenty of power and lets the miners drill holes from 36 to 40 feet in depth — using coupled steel. Total footage drilled per man-shift runs from 120 to 150 feet.

Performance like this does a lot to keep costs down. It also accounts for the growing popularity of Le Roi-CLEVELAND offset stopers wherever stoping is a problem.

Other features of these machines are: Removable water tube — no need to dismantle the machine. Graduated feeding pressure. Constant blowing at chuck keeps machine clean. Write us today for complete details.

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RD-33

CLEVELAND ROCK DRILL DIVISION
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What's YOUR problem?

H. Dillingham, lubrication specialist at Standard Oil's Evansville (Ind.) office, has helped this midwest mine solve vital operating and maintenance problems through his recommendations of lubricants. Within easy reach of the mine, he has given operators engineering service when they needed it.

There is a corps of such Standard Oil lubrication specialists throughout the Midwest. You'll find one located near your mine. Through special training and a lot of practical experience, this man has gained a working knowledge of lubrication that can mean real savings for you. You can obtain his services by contacting the nearest Standard Oil (Indiana) office. Discuss with him the savings you can make with such outstanding products as:

STANOIL Industrial Oils. Here's *one* line of oils that provides cleaner operation of loader and crane hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Mine Lubricants. These new, improved oils and greases provide better lubrication of cutters, loaders, locomotives, mine cars, and other underground equipment. They eliminate transmission-case deposits, reduce clutch-plate gumming, and minimize wear on gears and bearings.

CALUMET Viscous Lubricants. On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire rope.

Helps eccentrics keep their bearings . . .

SUPERLA
REG. U. S. PAT. OFF.
Greases

A large midwest coal mine has tested a number of products for the lubrication of screen eccentric bearings. None of these lubricants, however, has equaled the performance of a SUPERLA Grease recommended by a Standard Oil lubrication specialist. This SUPERLA Grease has successfully handled the job during 30 years of hard service. It has prevented bearing failures and minimized maintenance because of these lubricating qualities:

High load carrying ability. SUPERLA's strong lubricating film keeps wear at a minimum, protects bearings against shock loads.

Unique heat resistance. SUPERLA Greases remain stable at prolonged normal temperatures. Moreover, they provide safe lubrication during periods when operating temperatures are in excess of that which ordinary cup greases will withstand.

Stability to oxidation. Because of their highly stable composition, SUPERLA Greases resist changes produced by oxidation, retain their original condition longer than conventional products do in storage and in use.

These qualities of SUPERLA Greases will reduce bearing maintenance in your mine not only for screen eccentrics but for a great variety of tipple, shovel, and underground equipment.

Discuss the advantages of SUPERLA Greases with a Standard Oil lubrication specialist. His headquarters are near your mine. How you can benefit from his services is explained at the right.

Standard Oil Company (Ind.), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD

Mine Operators pick the Big 8 cyl. BUDA Diesels for

More Piston Displacement
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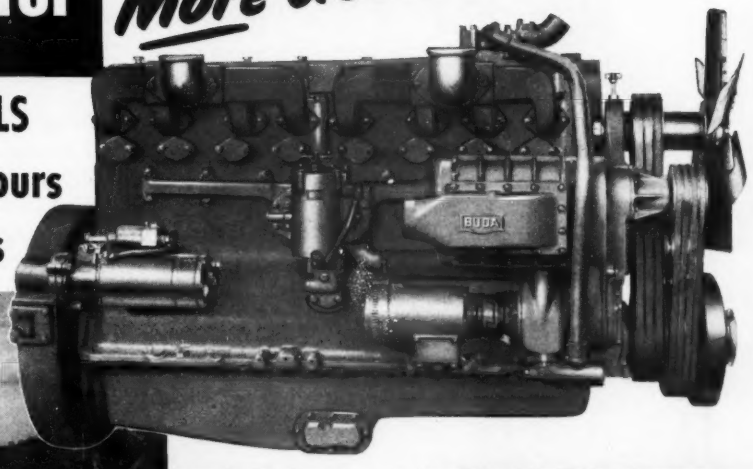
350 H. P. BUDA DIESELS Average 6000-9000 Hours Before Major Overhauls



Compare the piston displacement . . . lugging ability and useable horsepower that the BIG Heavy Duty Buda Diesels offer and you can see why mine operators are switching to these great new Dyna-Swirl Diesels.

Operators get faster trips with heaped loads—less maintenance—lower fuel cost per horsepower—and an average of 6000 to 9000 hrs. between overhauls. Check the advantages of Dyna-Swirl Diesels . and install and specify them in your mine haulage equipment to get lower cost per ton hauled.

Ask your Buda Distributor or write for the New FREE Illustrated Bulletin No. 1526. No obligation
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BC-8

A Power-Full and Dependable Name in Engines

BUDA

you can stop dry drilling with a GARDNER-DENVER RB STOPER

An exclusive Gardner-Denver feature can help you eliminate dry drilling. It's the new *air-operated* water control valve — available only on Gardner-Denver RB Stopers.

This unique valve assures a flow of water to the face of work both before and during the drilling operation. *One* throttle valve, operated by a conventional throttle valve handle, controls all functions of drilling and water control. The desirable "water on—air on—air off—water off" cycle required in some localities is provided automatically.

and here's another RB advantage you'll like

The throttle valve is fitted with a tubular screen which is automatically cleaned by live air each time the handle is brought past the "off" position. Any accumulated dirt is blown out of the drill, and time out for cleaning a clogged screen is practically eliminated.

Gardner-Denver RB104 —the heavy-duty self-rotating stoper with exceptionally high drilling speeds.

Gardner-Denver RB94 —the fast drilling, self-rotating stoper that weighs only 100 pounds.

Bulletin SD2 gives complete information on Gardner-Denver Stopers —write today for your copy.

Gardner-Denver Stopers are famous for their safe handling, fast drilling, smooth feeding and their constant sludge protection.

GARDNER-DENVER Since 1859

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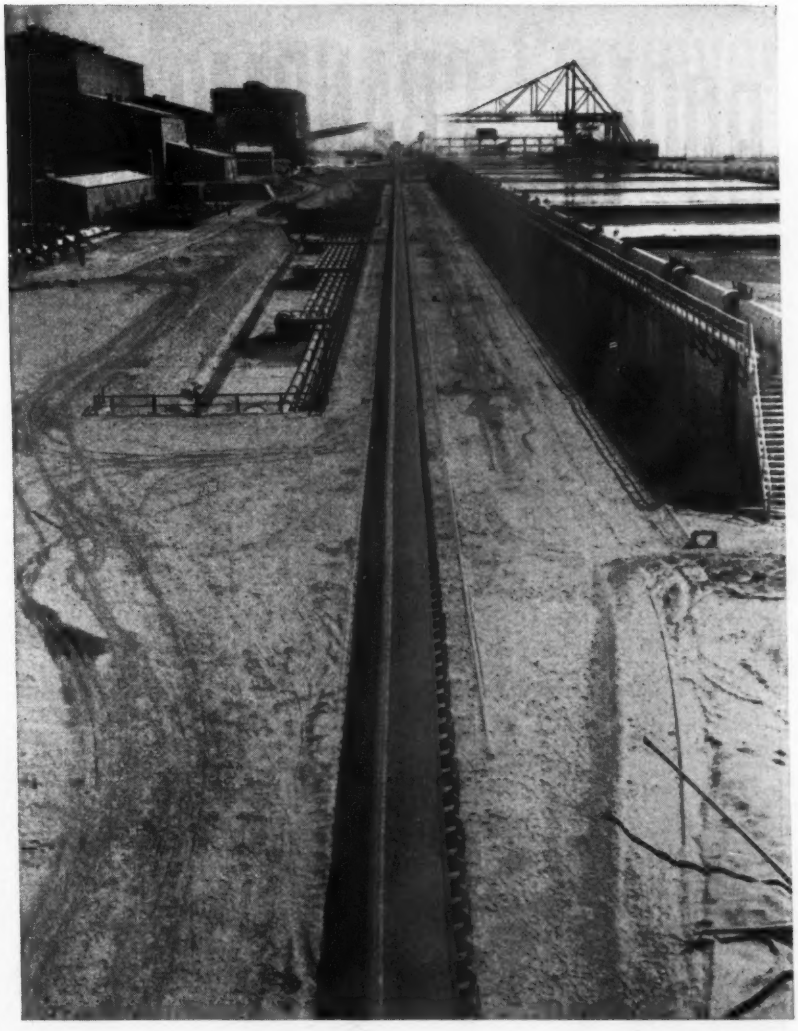

A Quarter of a Century— and **90 MILLION** Tons of Ore Prove the Superiority of this

S-A BELT CONVEYOR

Only a really heavy-duty conveyor carrier of rugged construction could take the punishment of twenty-five years of heavy ore handling . . . and still be good for many more years of service. As solid proof of this, the users who plan to extend their conveying system, specify that the new carriers be No. 444 S-A belt conveyors—"exactly the same as originally furnished."

In designing a system of this type—to meet stiff operating requirements—S-A engineers draw on their accumulated experience of fifty years in working with bulk materials handling problems. In addition they are free to specify the most suitable equipment for any job, as the S-A line of bulk conveying equipment is *complete*.

S-A engineers will gladly talk over your material handling with lower operating costs in mind. Write us today—no obligation.

MINING & PROCESSING OPERATIONS

Reduced and sized ore is moved by 60" wide S-A belt conveyor from crushing and screening house to travelling unloading bridge. The latter is a cross belt for depositing ore in a series of large vats parallel to the S-A belt conveyor. Material is reclaimed from the vats by an unloading bridge and grab bucket. The belt conveyor, illustrated, as well as other belt conveyors in the system, are equipped with S-A No. 444 live shaft carriers.

1901-1951

50 years experience with bulk handling

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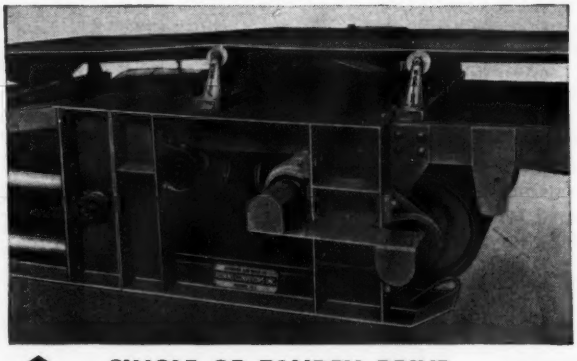
DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

ROOM...GRANDMOTHER...OR SLOPE

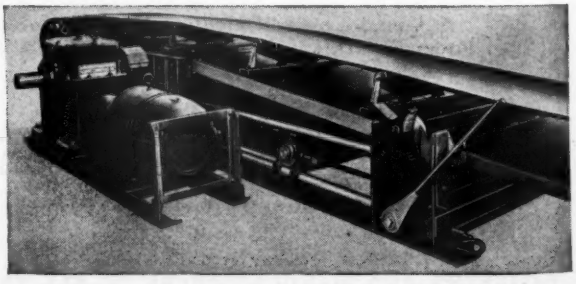


SINGLE OR TANDEM DRIVE

Hewitt-Robins Mine Conveyors come equipped with both single and tandem pulley drive elements. Provide ample horsepower for lift and length up to the very limits of belt capacity. Reeving of belt handles level, uphill or downhill service requirements.

UNIFIED DRIVE SECTION

Motor, reducer and controls mounted on a single base—skid-designed for easy moving about. Can be located on either side of the conveyor. Drive reversible—incoming for men and material, outgoing for high output of product.



there's a Hewitt-Robins Mine Conveyor to meet your specific requirements

Solve your underground conveying problems the easy, economical way. With a choice of THREE types of Hewitt-Robins Mine Conveyors, you are sure to get exactly the equipment you want.

TYPE I has *internal* drive for level or *up*hill operation; in 26", 30", 36" and 42" widths—lengths to 3000 feet or more.

TYPE IS has *internal* drive for level or *down*hill operation; in 26" and 30" widths—lengths to 3000 feet or more.

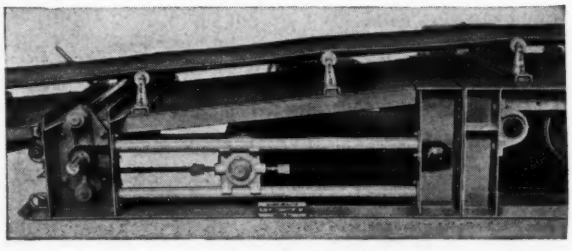
TYPE H has *head* drive for level or *up*hill operation; in 26" and 30" widths—lengths to 2000 feet.

Intermediate Sections are standard, fit all three types. Assembly is easy—both ends are identical, need no "matching up." Made in 8' and 10' rigid and demountable sections. Also available are Intermediate Channel Sections in 12' lengths—30", 36" and 42" widths.

Only Hewitt-Robins can offer you a complete mine conveyor "package"—machinery *plus* belt, motor, reducer and drive! You can order equipment to fit your needs to a "T"—single or tandem pulley drive . . . internal or tail takeup . . . the famous Ajax® heavy-duty belt, in the required length and width.

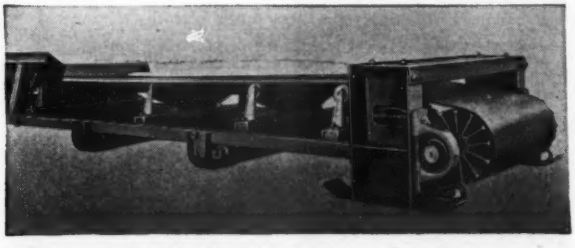
The sturdy machinery is built for the toughest kind of service. You get ball or roller bearing, one-shot lubrication idlers . . . lagged pulleys for maximum power transmission . . . a conveyor backed by over half a century of engineering and manufacturing experience. And, only Hewitt-Robins leaves you worry-free—takes complete *unified* responsibility for successful performance of machinery *and belt!*

Make sure you get the best for your money. Write for detailed specifications. Address: Hewitt-Robins Incorporated, 1010 Pennsylvania Ave., Charleston, W. Va., or 270 Passaic Ave., Passaic, N. J.



INTERNAL TAKEUP

Located directly back of the drive. Handles 10′ of belt slack. Operated by reversible ratchet-wrench working on gear reduction to minimize manual effort. Arranged so an automatic counterweighted gravity take-up can be added if desired—eliminating manual adjustment. Double-acting pawl prevents back-up.



TAIL SECTION

Telescopic type to provide tail takeup action. Easy to clean out—no steel work under tail pulley. Has transverse cover to protect pulley, bearings and belt. Strong enough so that you can rest a feeder on it.

NEW 2¼" TROUGHING IDLER has *roller* bearings. Demountable, easy to assemble under the belt. Triple grease seal locks grease in, keeps dirt and moisture out.

HEWITT-ROBINS
MINE CONVEYORS

Hewitt-Robins is participating in the management and financing of Kentucky Synthetic Rubber Corporation.

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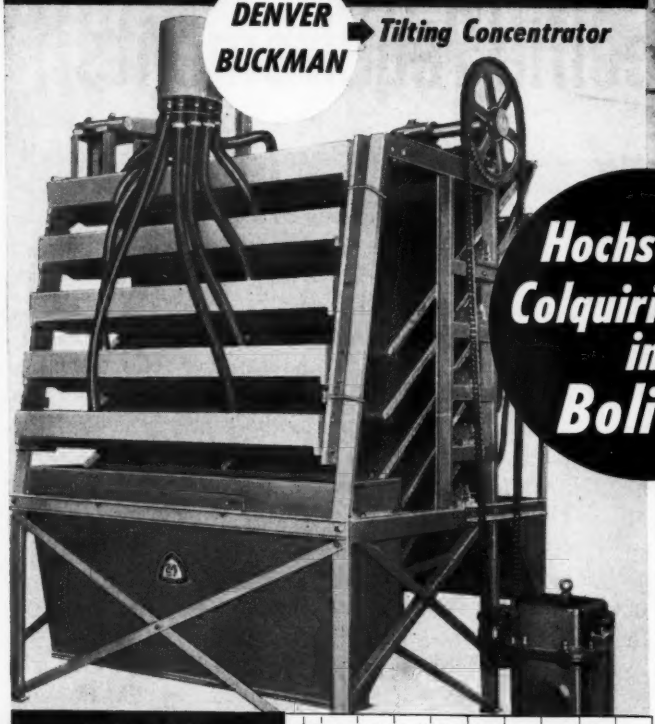
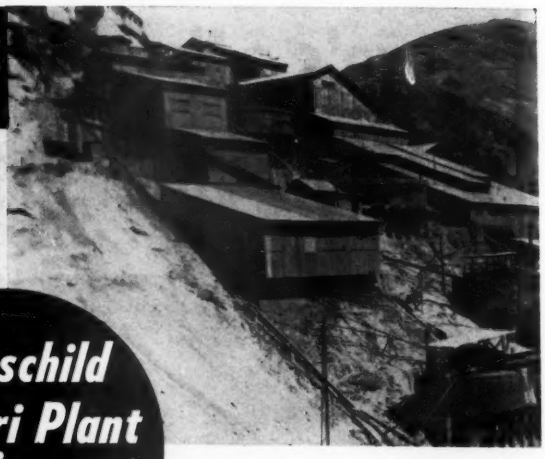
Recover Tin, Tungsten and other high Specific Gravity minerals in —200 mesh range at low cost with—

DENVER BUCKMAN ➡ *Tilting Concentrator*





Hochschild Colquiri Plant in Bolivia

recovers 15 tons per month at a cost of only 7c per ton milled

(Quoted from November 1950 Mining Engineering)

"The tests reported in this paper indicated a tin recovery of 42 pct. The actual plant results for 1949 show a 54 pct. tin recovery from the Sullivan (Denver-Buckman) decks.

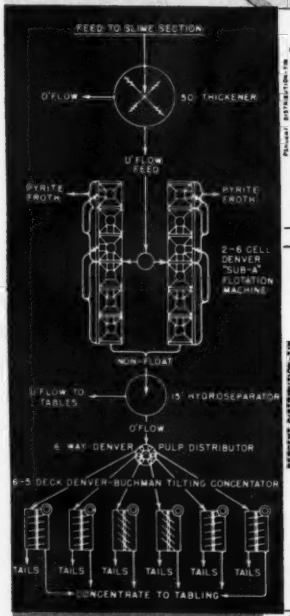
"The total average quantity of tin produced from the S deck section in 1949 was 15 tons of tin per month. This corresponds to 3 pct. of the total mill recovery.

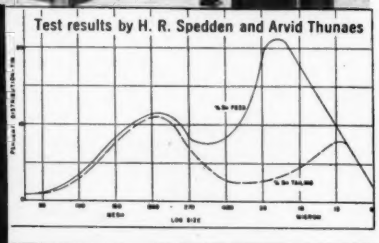
"The operation of the whole slime plant in Colquiri including flotation and fine sand tailing, cost $0.07 per ton milled.

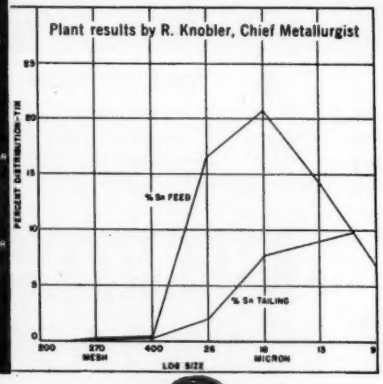
"In the year 1949 only $317.00 was spent for spare parts and material for the Sullivan decks in Colquiri with a total of 268,600 tons milled."

Because of its ease of operation, The Denver-Buckman Tilting Concentrator is far superior to any known type of machine for recovery of cassiterite and other high specific gravity materials in fine sizes.

Denver-Buckman Concentrators are available in half sizes for laboratory pilot plant work, or the testing can be done by Denver Equipment Company Ore Testing Division on a cost basis.







FLOTATION ENGINEERS

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Editorials

JOHN C. FOX, *Editor*

MARCH, 1951

Prevent the Pinch

IN testimony before a subcommittee of the Senate Armed Services Committee a high administration official recently stated, "In recent months we have become increasingly aware of the vital importance of our manpower resources in the planning and operation of the national defense effort . . . . We possess great strength in our unsurpassed industrial machine, in the highly developed skills and 'know-how' of our working people, and—above all—in the initiative, resourcefulness, and enterprise which are the products of our democratic way of life . . . .

"We must increase our resources of skilled manpower and maintain an adequate flow of youths into occupations which are critical to the defense effort. We must plan to conserve and increase these skills and to put them to work where they will do the most good. And in building our military power we must, to the greatest extent possible, safeguard the democratic institutions which have given us these advantages and which we are arming to protect."

The ultimate sources of raw materials and energy to supply our complicated industrial machine lie in mining and agriculture. It behooves us, therefore, to examine carefully all means possible to preserve the labor force in those fields and to increase their numbers and quality.

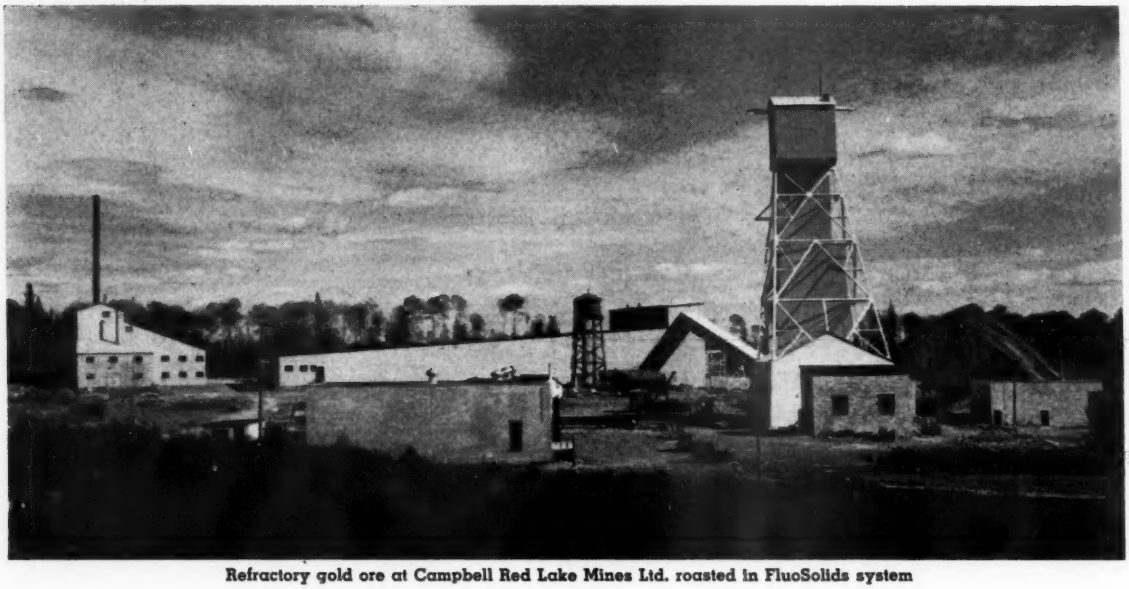
A healthy mining industry is one which is producing at a high level from presently developed mineral deposits and at the same time laying the foundation for continued high production by finding and developing new sources. During World War II mining performed prodigies of production, but only by putting every available man where he was actually getting ore or coal out of the ground and through the treatment plants. Development work was perforce neglected. As a consequence, at the close of active hostilities many mines found themselves with known reserves virtually exhausted and no new sources available. Luckily, World War II did not last until all of our developed reserves had thus been sold short by such an unforesighted policy.

The present situation is different. We are not engaged in an all-out shooting war, but are being called upon again to boost output to the limit—this time over an extended period, variously estimated at from 10 to 15 years. A program of this nature makes exploration and development work a prime requisite.

Mechanization of mining processes multiplies the potential output of the miner but also increases the skill and know-how required of each man. Exploration techniques likewise are constantly improving. Accordingly, the operator must increase his skill and knowledge of the instruments and techniques he uses. To avoid bankrupting our mineral industry and thus bringing ruin to our country, training programs are called for, to increase the potential of already highly skilled workers and to educate the new blood so necessary if we are to perpetuate the fine traditions of service to the country that characterize the mineral producing industries.

The mere establishment of training programs is not enough. In the interest of national security and the maintenance of a strong, productive economy, the domestic mining industry must be permitted to retain its manpower. It is estimated that two-fifths of the men in all occupations classed as critical are under 35 years and hence of draft age. They, however, constitute only about four per cent of all men under 35. Surely, a sound military deferment policy would be one that draws upon men in less essential occupations and avoids the manpower mistakes of World War II—errors which if repeated will play havoc with the very foundation on which our entire economy rests.

Clearly needed then are a program for training the present labor force in latest techniques and a system for developing new workers in the mining industry, coupled with a sound and systematic policy of deferment to keep trained men in and bring new workers into the mining industry.



Refractory gold ore at Campbell Red Lake Mines Ltd. roasted in FluoSolids system

FluoSolids Roasting of Sulphides

Operating and Economic Advantages Offered by Process That Fluidizes Solids

By T. B. COUNSELMAN
Manager, FluoSolids Division
The Dorr Company

FLUOSOLIDS is the partial suspension of solid particles in an upward moving stream of gas. When so partially suspended, the solids are said to be fluidized and behave much like a liquid. The mass is boiling and bubbling, similar to boiling water. It will seek its own level, like a liquid; will overflow a weir or transfer pipe; will have an apparent density much lighter than that of the solid particles, either singly or as a settled mass. It will have a uniform consistency as to particle size, chemical composition, temperature, etc. The fluidized mass will exert hydrostatic head, and pressure taps will show differential pressures between points at various depths in the bed. The top of the fluidized mass although irregular, like the surface of a boiling liquid, has a sharp line of demarcation from the gas above. Most important, every solid particle is individually surrounded by a film of gas or air.

Heat may be applied to the mass, either extraneously introduced, or resulting from chemical reaction between the solids and the gas. For instance, in the roasting of sulphide concentrates, or ore, the fluidizing gas is air. When the solids are heated, initially by extraneous heat, to combustion temperature, the sulphur in the solids furnishes the fuel to supply the heat. The upward movement of the fluidizing air sweeps out the sulphur dioxide resulting from the combustion, replacing it with new oxygen from the fluidizing air, and carrying the oxidation of the sulphur to the desired degree of completion.

The calcined solids either overflow the discharge pipe and are thus withdrawn, through a suitable seal, from the reactor as the overflow product; or, the fine sizes of calcined particles are entrained with the products of combustion and swept upward and out of the reactor. These entrained solids are then trapped out of the gas stream by means of cyclones, waste heat boilers, Cottrells, scrubbers or various combinations of such gas cleaning units. These entrained particles are substantially as completely roasted as the calcine in the overflow product. The amount of solids entrained varies with the grind of the feed, the velocity of the gas, and the decrepitation of the solids when brought up to calcining temperature. In general, the percentage of solids so entrained is less than in flash roasting and probably more than in multiple hearth roasting. Since the entrained solids are as fully roasted as the overflow product, and since the quantity of solids has no effect on the size of cyclones, the percentage of entrainment is not too important.

In sulphide roasting, air, introduced into the windbox by means of a blower, is uniformly distributed under the entire bed by means of a constriction plate, usually constructed of refractories, and having regularly spaced openings. These openings are of such size as to insure uniform air distribution. The pressure at the blower must be sufficient to overcome the pressure drop through the holes in the constriction plate, plus the pressure drop through the depth of bed which is to be used, plus the resistance of cyclones and ducts. In roasting sulphides in single compartment FluoSolids reactors, the pressures are approximately 3-4 psi. Volumes required are the theoretical, or a little less, or considerably more, depending on the problem.

The bed depth is varied from one to six ft, or more, depending on the particular job to be done. Increase of bed depth increases the detention

time in the bed, and increases the pressure drop through the bed, and consequently the required pressure at the blower, but has only a minor effect on the capacity of the reactor. This depends on area and the volume of gas to be handled as a result of oxidation of the sulphur to sulphur dioxide. In other words, the higher the sulphur content of the feed, the lower the capacity, on that material, per unit area of reactor.

Process Advantages

There are no moving parts, exposed to high temperature, inside the reactor and refractory life has been found to be exceptionally long. Both of these factors add up to low maintenance.

It is entirely feasible, where roasting conditions require, to build a FluoSolids reactor so that no metal comes in contact with the hot gases and hot solids, which are in the reactor.

Bed temperature is uniform as measured by thermocouples at various points. This temperature is automatically controlled to any desired figure, with an accuracy of plus or minus 10-20° F, by injection of water into the bed. Control can also be exerted by controlling the feed rate; returning cooled calcine, or cooled exit gases, to the bed. Only the water addition has been fully worked out, in practice, as yet. However, the other methods are all standard with other roasters. Control of the temperature, sometimes within rather narrow limits, is important to minimize ferrite formation in zinc roasting; to control iron solubilities in copper sulphating; to minimize formation of copper ferrites, or to avoid incipient sintering that might result in defluidizing. Accurate temperature control of this character appears possible only with FluoSolids.

Gas composition is under accurate control, because the only air which can get into the reactor is that which is deliberately introduced by means of a blower. Therefore, in roasting sulphides, FluoSolids results in stronger SO_2 gas than is possible with other types of roasting equipment.

Because of the close control, it has been found possible to roast sulphide concentrates of lower sulphur content, without the use of extraneous fuel, than is generally the case. For instance, pyritic gold ore flotation concentrate, having as little as 12 percent sulphur, and in the form of a filter cake carrying 12-15 percent moisture has been successfully self-roasted.

Another advantage is that, if it is desired to shut down for a shift or longer, feeding is stopped and no air is blown into the windbox. The bed which has been fluidized settles down on the constriction plate. The reservoir of heat is sufficient so that starting the blower and starting the feed, within a reasonable time, will bring the reactor back to roasting temperature quickly. Records show that reactors shut down in this manner for as long as three days have been restarted without difficulty or additional heat.

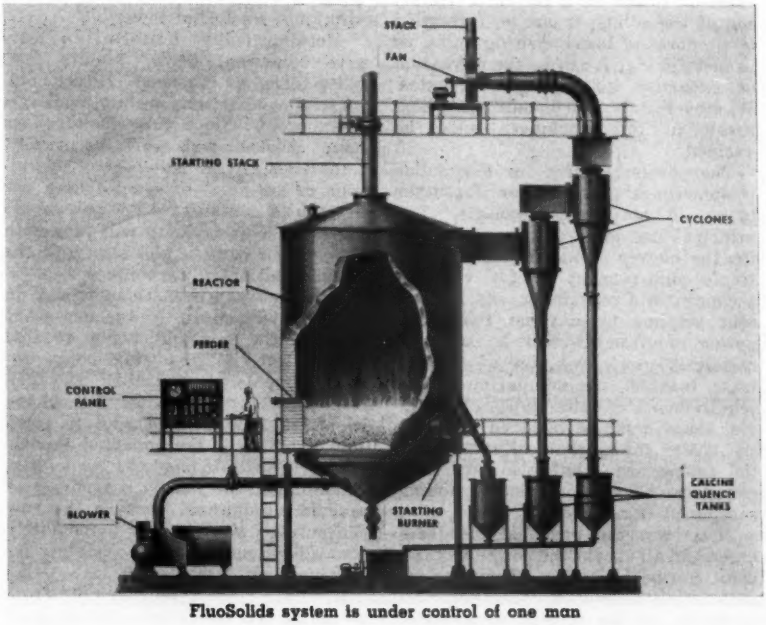
FluoSolids reactors find important place in flow sheet of Golden Cycle Corp's. new Carlton Mill

Feeding may be accomplished by means of a screw feeder, if the material to be roasted is dry or in a crumbly condition. If the feed is sticky and clay-like, then it is preferably repulped, in an agitator, to the thickest pumpable consistency, and pumped into the reactor. Water introduced with the slurry is less than the total amount required for temperature control which therefore can be kept fully automatic. A thermostat actuates a diaphragm water valve, and the water is added as a small stream at one point in the bed or with the slurry feed. The violent motion of the bed keeps the temperature uniform throughout.

Feeding as a slurry avoids the troublesome problem of pre-drying, or of handling sticky filter cakes. Naturally, more sulphur is required to make the material self-roasting, and 16-18 percent sulphur has been found to be about the minimum. Slurry feed cannot be used where the SO_2 gas is to go to a chamber acid plant, but is entirely satisfactory for a contact acid plant, where the gas is scrubbed, and goes through a mist Cottrell anyway.

When roasting flotation concentrate, produced from ore which has been ground even as coarse as 20 mesh or finer, no further grinding is required for FluoSolids roasting, such as is necessary for flash roasting. On the other hand, a disadvantage of the system, as compared to multiple hearth roasting, is that the feed must be crushed to a fluidizing size, which is approximately all pass 14 mesh. The lighter the gravity, the coarser this top size.

In the roasting of sulphides power



FluoSolids system is under control of one man

failures do not bother the process. Automatically, the blower stops and the feed stops, exactly as in a planned shut down for a shift or so; and the reactor may be started up again just as readily.

One of the chief advantages is the ease of operation as the system is well instrumentized. When operators have become accustomed to the equipment and its controls, there is little for them to do beyond assuring a supply of feed and air and the disposal of the calcine. Literally, pushing stop and start buttons and periodically observing the instruments is all that is required. One operator could take care of three or four reactors with ease, maintenance is so small that it is almost negligible.

Disadvantages Can Be Overcome

One of the disadvantages of the process is the tendency of the material in the bed to trickle down through the holes in the constriction plate into the windbox. One method which has been used to minimize this has been ball checks which fit into the conically shaped upper end of each opening. These work well on the initial start up, but gradually become worn out by abrasion and disappear. So long as the reactor is in operation, the air velocity through the holes prevents any leakage of solids. However, a revised type of constriction plate which has been under test for some time will apparently overcome this difficulty.

Another disadvantage of FluoSolids is that if the solids in the bed become sticky, fluidization gradually stops; and the bed, in effect, "freezes up." This stickiness can come from several causes. It can be a fusion or sintering of the solids; it can be formation of products of lower melting point, or in metallizing; it can be the formation of excessive amounts of sulphates. Whatever it is, the conditions which result in this stickiness must be avoided.

The power required for FluoSolids is sometimes greater than for other types of roasting equipment. The principal use of power is, of course, for the blower furnishing air. For a single compartment reactor, roasting a concentrate containing, say 35 percent sulphur to a sweet roast, the power requirement will be approximately 20 kwh per ton of concentrate roasted. In comparing power requirements of other types of roasters, there must be included not only the power for mechanical rotation of the rabble arms, but also any fans, elevators, blowers, or finer grinding equipment if required.

These are the principal disadvantages and all except the power requirement can be overcome. They are far outweighed, costwise, and performancewise, by the several advantages.

Roasting Gold Ores

Calcines become more amenable to cyanidation when they are roasted. Concentrates may contain arsenic, antimony, telluride, or other elements that either lock up the gold or act as cyanicides. Also, the roasting off of the sulphides make the calcine more easily penetrable by cyanide solution.

Roasting of arseno-pyrite gold ores was one of the first commercial applications of FluoSolids, and attractive results were secured right from the start. Investment cost was lower than for comparative capacities of other types of roasters. Operating costs were lower, and this advantage was greatly enhanced when the sulphur content fell below about 30 percent because, in general, other roasters then required extraneous fuel. Maintenance was lower, and labor was, if anything, somewhat lower.

Metallurgically, FluoSolids tests give somewhat better results than older forms of roasting. Direct commercial comparisons are not available. Commercial FluoSolids installations have checked test work accurately. Capacities are on the order of magnitude of 2-3 sq ft of reactor area per dry ton of concentrate (20 percent S) per day. This capacity will vary with the sulphur content and also with the arsenic and antimony content.

It has always been thought that in roasting off arsenic it was necessary to hold the material being roasted close to 900 F for about four hours, until the arsenic was fumed off, and then raise the temperature of the calcine to about 1300 F, and cool it down slowly. This is the so-called Beattie roast. The criticism was made that FluoSolids could not do a good job of arsenic elimination, because the raw concentrate was plunged immediately into a heat reservoir, the temperature of which was 1100-1300 F.

Here are some typical results from a commercial operation, operating at a rate of over 60 tons of material roasted per day. (Table I)

These figures are monthly plant averages. Certainly, not much more can be asked in the way of sulphur and arsenic elimination, nor of gold extraction. This concentrate was slurry fed, at 80 percent solids, and was self-roasting at a temperature of 1200 F.

It is interesting to note how the calcine reported in the overflow and in the cyclone products compares in view of the previous statement that the cyclone products were equally well-roasted with the overflow products. Here are some figures, again from plant operation. (Table II)

A great deal of experimental work has been done, both on a plant scale and in test FluoSolids reactors at Westport, Conn., to determine the optimum conditions for roasting arseno-pyritic gold ores. A strongly reducing roast resulting in a black calcine wherein most of the iron is magnetic, results in attractive extractions but high cyanide consumptions and excessive fouling of cyanide solutions. On the other hand, a highly oxidizing roast resulting in a red calcine, gives lower cyanide consumption and less fouling of solution. But the extraction is not so good and the cyanide residues are higher. The optimum condition as established by a long series of tests, is a slightly oxidizing roast that results in a chocolate colored calcine. This gives gold recoveries quite as good as a black roast, and low cyanide consumption just about as good as with a strongly oxidizing roast.

On difficult concentrates, high in arsenic (over about seven or eight percent), and with considerable antimony (two percent or more), it has been found desirable to go to a two-stage roast. The concentrate is first roasted at a somewhat lower temperature in an SO_2 atmosphere deficient in oxygen. In this stage most of the arsenic is

TABLE I

	Feed to FS Reactor	Reactor Calcine	Cyanide Residue
Gold, ounces per ton	8.0	8.3	.38
Total sulphur	21.5	.65	..
Acid insoluble sulphur	...	.06	..
Total arsenic	6.1	2.37	..
Acid insoluble arsenic	...	.07	..
Iron	28.3	33.9	..
Gold extraction	...	95.4	..

TABLE II

	Feed to FS Reactor	Reactor Overflow	First Cyclone	Second Cyclone
Total sulphur	14.9	3.3	2.5	2.2
Acid insoluble sulphur	..	1.2	.4	.2
Total arsenic	7.5	4.35	4.93	5.2
Antimony	.17	.20	.14	.19
Iron	20	20.3	27.7	28.5
Al_2O_3	2.9	4.1	2.0	3.0
CaO	9.7	8.5	12.4	10.9
MgO	6.1	5.1	7.1	7.0
Insoluble	21.6	39.7	19.3	26.2

distilled off. Then the hot, partially-roasted calcine goes to the second stage. There excess air is supplied and the remaining sulphur is burned off. Such treatment gives the best gold extraction from these difficult concentrates.

Telluride ores, or straight pyritic ores carrying no arsenic, present no problem at all. Results comparable to established practice, and in many cases even better, are readily obtainable.

Pyrite Roasting

Although the primary objective of roasting pyrite is the production of SO_2 gas for sulphuric acid manufacture, waste heat recovery is frequently desired and often the calcine is used as iron ore in steel manufacture. Considerable work is being done, with various processes, on the production of elemental sulphur, either from the weak atom of sulphur in the pyrite or from as much as possible of the remaining sulphur, in preference to acid manufacture.

Pyrite used may be material mined for this purpose, by-product pyrite from differential flotation of other sulphides, or from suitable treatment of refuse from coal preparation.

Essentially, roasting pyrite is similar to roasting pyritic gold ores, except for the amount of sulphur in the material to be treated, the specifications of the strength of gas required, and the specifications of the calcine. Although pyritic gold ore concentrates will carry 20-30 percent sulphur, pyrite mined or concentrated for use in acid manufacture will contain nearly 50 percent sulphur, or less if there is much pyrrhotite present. The larger sulphur content results in greater gas volume and consequently lower capacity per sq ft of reactor area.

In the roasting of pyritic gold ores, the SO_2 content of the exit gas is of minor importance; in fact it should be as dilute as possible because the gas is usually wasted to atmosphere. The roasting conditions are dictated by the cyanidability of the calcine. For contact acid manufacture, however, the SO_2 content of the cleaned gas, on a dry basis must be 7.5-8.0 percent. This is just about the maximum obtainable with most standard forms of roasters. Because of the closely controlled conditions, FluoSolids enables production of a 14-15 percent SO_2 gas, dry basis, when burning 48 percent sulphur pyrite. Even with pyrrhotite carrying only about 20 percent sulphur, 11-13 percent SO_2 gas may be expected.

This higher strength of gas makes the gas-cleaning equipment smaller in size because of smaller gas volumes. Also, this high strength gas gives added leeway for the addition of the necessary oxygen for conversion to sulphuric acid. The close controls of FluoSolids reactors minimize the production of SO_3, which is not desirable for contact acid manufacture.

Where acid is to be produced by the chamber process, slurry feed cannot be used, and the roaster feed is generally dried. Also, water cannot be used for temperature control. There is no such limitation for contact acid. Where waste heat recovery is desired, temperature of roasting should be as high as possible without danger of sintering. Temperatures of 1000 C have been found satisfactory for FluoSolids roasting.

In cases where the pyrite is copper bearing and the calcine is to be used for steel making, FluoSolids is particularly advantageous. If the copper in the pyrite to be roasted is not already below the desired limit, roasting will usually form ferrites that will lock up the copper so that it cannot be leached down to the desired analysis except by a second, chloridizing roast. With FluoSolids, however, because of close temperature control, the copper can be made soluble and can be leached usually to 0.2 percent Cu or lower on the calcine.

If the pyrite to be roasted is massive, it must be crushed to about 10-14 mesh, so that it may be fluidized. Flotation concentrates require no further grinding. The dust carryover is no greater than encountered in hearth roasting and somewhat less than in flash roasting. It will range from 20-40 percent of the calcine, and the dust carryover is just as well roasted as the overflow product.

Table III shows typical results obtained in roasting massive pyrite, pyrite flotation concentrate and cupriferous pyrite.

Where waste heat boilers are used, the hot gas would go to the boiler direct and the dust trapped out in the normal way. A cyclone would probably be used following the boiler, and one could be used ahead if desired but would have to be stainless steel or brick-lined construction. The same would be true where waste heat boilers are not used. In that case the gas would have to be cooled by some form of heat exchanger before going to the hot Cottrell. For contact acid the gas is then scrubbed and passed through a mist Cottrell before going to the acid plant.

Sulphur can be reduced from 0.5-1.0 percent total Sol., lower if desired,

TABLE III

		Massive Pyrite	Pyrite Flotation Conc.	Cupriferous Pyrite
Feed Analysis Copper		...	...	13.3
Iron		42.5	45.6	34.6
Total sulphur		48.3	49.4	40.0
Soluble sulphur		0.3	0.6	0.3
Insoluble		4.8	...	...
Cumulative Screen Analysis	+14	3.2		
	+20	23.5	All Pass	All Pass
	+28	43.7		
	+35	57.4		
	+48	68.6		
	+65	78.0		
	+100	85.0		
	+150	90.6		
	+200	93.5		
Roasting Temperature		900C	700C	700C
Overflow Product % Wt.		70.4	49.8	47.7
Carryover % Wt.		29.6	50.2	52.3
Gas Strength—dry basis % SO_2		14.3	16.2	7.0
% SO_3		TR	TR	...
O_2		0.1	...	3.0
Calcine Analysis—*Overflow*				
Iron		46.9	70.6	
Total S		0.42	0.75	
Sulphide S		0.32	0.25	
Insol		29.5	0.71	
Carryover				
Copper				
Iron		69.4	69.4	
Total S		0.42	1.1	
Sulphide S		0.09	.33	
Insol		3.5	0.58	

Cupriferous Pyrite	Water Soluble			5% H_2SO_4 Soluble		
	Calcine	Residue	% Soluble	Calcine	Residue	% Soluble
Overflow Copper	29.2	2.6	91.5	31.1	0.9	97.3
Iron	0.6	58.2	1.0	1.4	61.2	2.3
Carryover Copper	19.6	2.2	87.2	20.8	1.3	92.7
Iron	.35	62.3	0.4	1.2	63.6	1.5

Over-all Solubilities: Water Soluble Copper 90.2
5% H_2SO_4 Soluble Copper 95.2

when the calcine is to be sintered for use as iron ore five to seven percent sulphur can be left in the calcine to serve as sintering fuel. In such case the final sulphur in the sinter can easily be reduced to 0.01 percent. The close control in FluoSolids roasting makes it possible to stop roasting at any desired sulphur analysis.

Capacities with a 46 percent sulphur pyrite are approximately 2.5-3 sq ft of reactor area per dry ton of feed per day.

There are no commercial installations roasting pyrite for acid manuture as yet. However, a great deal of test work has been done with entirely satisfactory results that can be duplicated in practice.

Zinc Roasting

The objective in zinc roasting may be to prepare a calcine for leaching for electrolytic zinc or for retort zinc. Acid production is frequently a corollary objective since usually SO_2 cannot be allowed to escape to atmosphere.

When electrolytic zinc is produced, the roasting has as its objective maximum solubility of the zinc and of any cadmium present with normally a minimum of zinc sulphate production. It is usually desired to obtain a calcine carrying 0.1 percent sulphide sulphur and 2.5 percent or so total sulphur while maintaining solubilities of 90-95 percent of the zinc.

Solubilities are dependent on ferrite formation especially on relatively high iron concentrates. Close control of the temperature has been found essential to obtain maximum solubility which by inference corresponds to minimum ferrite formation. Much closer temperature control is inherently possible with FluoSolids than with other types of roasting and correspondingly higher solubilities have been obtained. Optimum temperatures have been found to range from 800-900° C.

The following are some typical results which have been obtained when roasting for electrolytic zinc:

TABLE IV

Calcine		Low Iron Concentrate	High Iron Concentrate
Overflow Product	Zinc	60.7	54.5
	Iron	6.7	13.1
	Sulphide S	0.09	0.11
	Total S	1.1	1.1
Carryover			
	Zinc	65.4	51.8
	Iron	5.2	10.3
	Sulphide S	0.01	0.05
	Total S	1.9	4.3

These are both flotation concentrates. Solubilities were not determined.

The SO_2 concentration in the gas will normally be about 11 to 12 percent, which is excellent for contact acid manufacture. The dust carryover and handling is somewhat similar to the case of pyrite roasting. The feed is almost always zinc flotation concentrate, and need not be reground. If available as a moist concentrate, the FluoSolids reactor can be slurry fed to avoid drying the concentrate. Usually the smelter is remote from the mill and the concentrate is at least partially dried to save freight. The method of feeding the reactor will then depend on conditions.

Sulphate formation seems to be a function of temperature in the cooling of the calcine. If this calcine is subject to a partial pressure of SO_2 when passing through this temperature range, about 850 C and below, and particularly in the case of high iron concentrates where the iron acts as a catalyzer, sulphates are sure to form in greater or less degree. This will increase the acid production and upset the balance in the electrolytic plant. Therefore, the entrained calcine fines must be stripped out of the gas at temperatures above this critical range. Little sulphate is present when the gas and entrained solids leave the reactor. Temperature reduction in waste heat boilers brings the solids into the critical range while still in contact with SO_2 gas, and therefore cyclones (stainless steel or refractory lined) ahead of the boiler would seem desirable. Otherwise the highly sulphated dust caught after the boiler, can be returned to the reactor to break down the sulphates.

For retort zinc the calcine is usually sintered in order to get maximum capacity from the retorts whether hand-fired or continuous. In the sintering operation the addition of salt helps to solubilize the cadmium. Some of the sulphur from the concentrate can be left in the calcine to furnish sinter fuel or coke brieze or low-volatile coal can be used depending on economics. Where it is desired to leave some sulphur in the calcine the exact control of FluoSolids makes this entirely feasible.

Some typical figures when roasting to leave sulphur in the calcine are shown in Table V.

Sulphates are usually not too harmful in retort zinc work. Also, the sulphide sulphur left in the sinter, although preferably lower than 0.5-1 percent, is not so critical as with electrolytic zinc. It is important to have a dense sinter to permit maximum charge per retort in the case of the customary blocks of hand-loaded retorts.

Capacities are on the order of magnitude of 2.5 to 3 sq ft of reactor area per ton of dry feed per day.

TABLE V

	Tri-State Concentrate			Arizona Concentrate		
	Feed	Overthrow	Carryover	Feed	Overflow	Carryover
Zinc	61.0			54.5		
Iron	1.8			4.2		
Arsenic	0.07			0.04		
Antimony	Tr			...		
Lead	0.96			3.8		
Total sulphur	30.6	2.7	4.1	30.6	3.6	10.2
Sulphide sulphur	30.6	2.1	2.5	28.1	2.0	10.1
Gas %SO_2		11.0			12.5	
%SO_2		2.0			0.2	

Copper Roasting

Treatment of copper concentrate may be carried out either to reduce the sulphur analysis a few points, to conform to the desired matte analysis in a smelter, or it can be used to make as much as possible of the copper water and weak acid soluble. In certain rare cases, the roasting may be for the production of strong (11-12 percent) SO_2 gas, for acid making or other purposes.

The partial reduction of sulphur analysis in a smelter usually means a reduction of four to six percent in the sulphur analysis. If that is the case, additional fuel will be required. Also, before such roasting is carried out, various fluxes are usually added and thoroughly mixed in a bedding system. This flux material is usually too coarse to be fluidized at desirable velocities. Therefore, this type of roasting does not seem well suited to FluoSolids.

In sulphating roasting, however, FluoSolids has outstanding advantages. Temperature must be controlled fairly closely, within about 20° C. Excess air must be controlled accurately. Such control can be made automatic if desired. In general, suitable adjustments will generally give water solubilities of 99 and 99.5 percent of copper, and five percent H_2SO_4 will dissolve about five percent more. Total

(*Continued on page* 53)

Coal rolls out safely and quickly at Piney Fork

Trolley Phone in Coal Mining

Constant Communication Promotes Safety, Efficiency and Production at Piney Fork Mine

By EVAN ADAMS
Assistant Mine Superintendent
Hanna Coal Co.

THE mechanization of underground loading in coal mines has brought with it an ever increasing need for improvement in other phases of operation. A mechanized mine, to produce its maximum tonnage, needs large capacity mine cars with trips running at high speed; this, in turn, emphasizes the need for efficient haulage systems with modern track equipment, and heavy, high-speed locomotives. In the development of such haulage layouts safety and efficiency are prime requisites. These two considerations led to employment of dispatchers at many large mechanized mines, as well as the installation of automatic block signal systems, and other safeguards to take fullest advantage of good track, and well-maintained rolling stock.

For many years, the coal industry lagged in modern, positive means of communication within the mine. The conventional type telephone did a remarkable job of supplementing other haulage safety devices but there was always much opportunity for human error. It was easy for the motorman to take a chance that all was clear, rather than stop his trip, check with the dispatcher by phone and follow instructions. Then, too, a dispatcher is only human and with many calls to handle from all over a large mine it is not unreasonable to assume that he may occasionally give incorrect orders. When instructions are given by telephone, it's too late to do anything about it after the motorman leaves the phone. Another source of error occurs where the dispatcher has given instructions to a trip-rider to be relayed to the motorman. In such cases, a lapse of memory on the part of the trip-rider can cause a haulage accident.

While the line telephone did, and will continue to do, an excellent job in providing underground communications, it does leave much to be desired in a large, fast-running, modern coal mine. It is certainly not the intent of this article to convey the impression that the conventional telephone has outlived its usefulness or that it will be replaced by the trolley equipment. Everyone realizes that a trolley phone can no more supplant a line telephone than an airplane can supplant an automobile. Both have their functions.

Early Experiments Fail

The first idea of applying a device such as the trolley phone to coal mines was more or less accidental. Back in the late 1930's the Pennsylvania Mine Inspectors and the Radio Engineers Society were holding conventions in Pittsburgh simultaneously. One of the mine inspectors happened to sit in on one of the radio sessions during a discussion of the potentialities of the radio and of its possible adaptation to industrial uses. After this session, two of the mine inspectors contacted the speaker and discussed the practicability of some sort of radio equipment for underground communication in coal mines. Subsequent investigation seemed to indicate that such a thing was feasible and, after some experimental work, a mine radio was developed. This was a two-way set, with impulses carried by means of the haulage trolley and return.

The first mine radio equipment was

(NOTE: Prepared from address by Mr. Adams before the National Safety Council, October 25, 1950.)

substantially the same as an office intercommunication system, but when applied to mining service, did not have sufficient power to overcome the interference and magnetic conditions encountered in a coal mine. As a result, it was impossible to transmit or receive messages for any appreciable distance underground. It should be understood, of course, that this restriction did not apply everywhere. There were some coal mines where the producing areas were not too far apart and where other conditions were such that this first radio worked satisfactorily. But for general use in a large, scattered-out mine, the application was very limited. However, the early installations were a big step forward in mine communication and gave impetus to the subsequent research and development undertaken by electrical and radio manufacturers.

Successful Installation at Piney Fork Mine

In 1947 the Hanna Coal Co., experimentally installed an early type trolley phone in Willow Grove mine near St. Clairsville, Ohio. Later types were installed in the early months of 1949 in Piney Fork mine which now has a total of 14 units in service. There are trolley phones on each main-line haulage locomotive; on the secondary haulage and supply locomotives; on the mechanics' jeep; on the lubricating truck which takes care of the lubrication of all mobile equipment in the producing sections underground; on the machinery movers' locomotive; in the machine repair shop on the surface; and in the dispatcher's office. The unit in the machine shop is connected through relays to an extension microphone and speaker in the office of the assistant superintendent.

The nerve center of the trolley phone network is, of course, the dispatcher's office. There is one dispatcher on duty for each of the three operating shifts at this mine. His headquarters is located on the surface near the preparation plant, approximately 2¼ miles from the main haulage portal; the distance underground from the portal to the farthest working place in the mine is approximately two miles at the present time.

The dispatcher's office—nerve center of a modern mine

The dispatcher controls the movement of all equipment on the main-line and secondary haulage roads. All motormen are instructed not to move on any of these haulage arteries without first obtaining clearance from the dispatcher by means of the trolley phone. It is felt that, even though the main-line haulage is double tracked underground for its entire length from just inside the pit mouth no chances should be taken in avoiding any possibility of human failure.

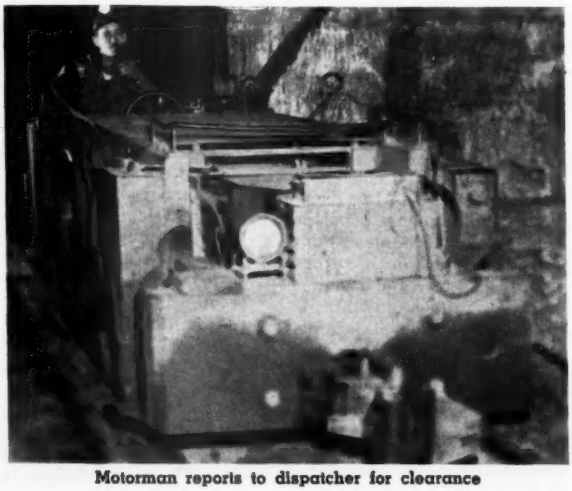
The outside tramroad from the preparation plant to the portal is approximately 2¼ miles long, single track with one passway in the center. It is doubly important, therefore, that no equipment moves over this stretch of track without clearance from the dispatcher. It was here that a fatal accident occurred three years ago. The dispatcher had delivered a message by telephone to the trip-rider of the outcoming locomotive to have his motorman wait at the pit mouth until an incoming supply trip had cleared that block. For some reason, the trip-rider forgot to relay the message and the two locomotives collided, killing the motorman on the outgoing coal trip. Had trolley phones been in use and both motormen instructed at the same time, this fatality would not have occurred.

Trolley Phone Has Many Uses

One of the major advantages of a trolley phone is the constant contact between the dispatcher and motormen. With the regular mine telephone, they are in contact only when the motorman stops and calls. If it is necessary for the dispatcher to change his instructions to the motorman, he cannot do so with the regular telephone. It may be interesting to note some of the other uses which have been found for the trolley phone at Piney Fork mine, in addition to its prime function of dispatching trips to and from the working sections.

Trolley phones are installed on the supply motors. In addition to dispatching the supply crew on regular trips through the mine, there is the operating advantage of being able to send supplies at any time to sections where an acute shortage of materials exists. On occasions when a producing section is out of timber or rails, for example, and the regular scheduled visit of the supply crew to this section might not be in time to prevent a stoppage of production, the section foreman calls the dispatcher and advises him of the situation. The latter can then immediately contact the supply crew by trolley phone, wherever they may be in the mine, and direct them to go at once to the section in need of material.

Assistant superintendent is in constant touch with all units



Motorman reports to dispatcher for clearance

This same principle applies to the mine mechanics' jeep, which is stocked with a wide range of repair parts. Numerous production delays have been minimized when mechanics were dispatched promptly to the scene of a breakdown.

Further operating advantages are gained through the increased ability of the dispatcher to apportion cars more equitably to producing sections. For example, there might be a breakdown on one section of the mine so it would be foolish to place additional empty cars there while another section might be "going to town" on production and could well use these extra empties which otherwise would sit idle until the breakdown was repaired.

Motormen are advised by trolley phone when they have lost part of a trip. This has doubtless prevented more than one bad haulage accident. If a motorman is aware that he has lost part of his trip, he can usually decide intelligently what action he should take to prevent an accident. In this same connection, other motormen, who might be following a trip where the cars broke loose, would be advised of this fact, simultaneously with the motorman affected.

In past years, it was difficult to clean track except on idle days due to the fact that the motor and empty cars which the clean-up men used were a traffic hazard on an operating haulage road. With the advent of the trolley phone, this road cleaning work can now be done on straight time because the track crew can be notified to get their equipment off the line in sufficient time to avoid any stoppage of the haulage cycle.

There have also been occasions where it was necessary to rerail cars at one end of a passway, or at some other switch, where it would be difficult to signal the motorman in the rerailing operation. In such cases where there happens to be another locomotive at hand, these signals can be relayed by trolley phone to the motorman whose car is being rerailed.

The phone system is being used for broadcasting safety messages to the haulage crews. This practice got considerable impetus last summer when one of the main-line haulage motormen attempted to sell strawberries over the phone. This really "sold" a program which management had suggested previously, the thought being that if strawberries can be sold over the phone, we ought to be able to sell safety the same way. So it is not unusual for our motormen to hear such things from the dispatcher as "Take your foot off that coupler"—"Wait a minute—turn your trolley pole before you move that locomotive"—"Watch your speed coming around that curve."

Mechanics are on tap when breakdowns occur

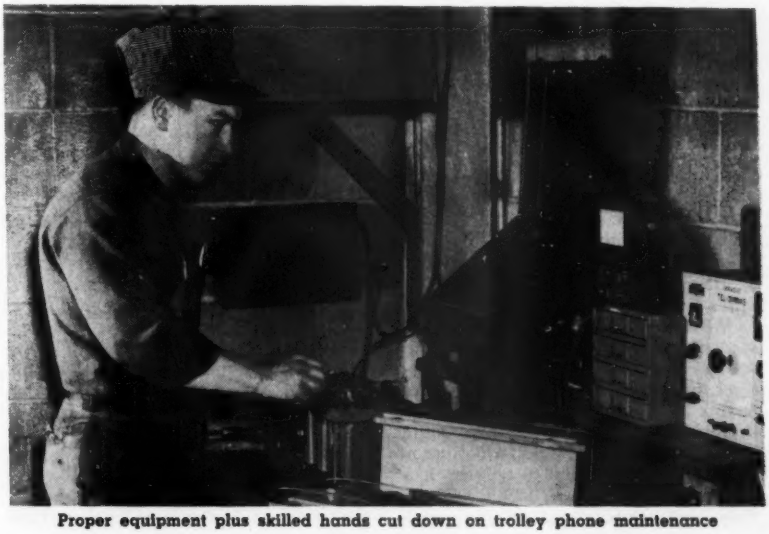
Construction Explained

This all sounds very good but the question of initial cost and maintenance arises. From our experience, the total cost of 14 units manufactured by the Farmers Engineering and Manufacturing Co. (of Pittsburgh) was $9,154.05. Labor to install them (one man shift per unit) amounted to $196.70. Other equipment such as: Spare parts, tube testers, signal generators, frequency standards, etc., cost $725. The total cost of the 14 units was $10,075.75 or an average of about $720 each.

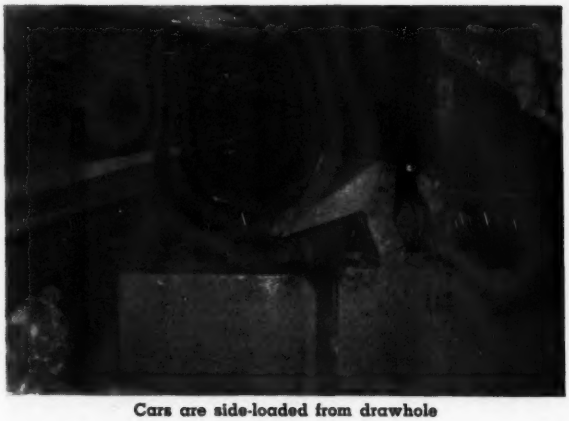
Each unit consists of a transceiver which slides into a steel case 10 in. high by 20¼ in. long by 7¾ in. wide and a power pack contained in a box 15¾ in. long, 6 in. wide and 3¾ in. high, fastened to the transceiver housing. Then there is, of course, a microphone and a speaker. The transceiver itself is built on a steel chassis with a removable steel cover. Shock mounting bars are separated from the chassis by rubber cushions to insulate the transceiver from the motor frame. At one end of the chassis there are plugs for the microphone and speaker connections and one twistlock connector on the end of a two-foot, 4-conductor cable which plugs into the power unit.

Internally the transceiver consists of a 100 kilocycle, frequency modulated transmitter, an audio-amplifier and noise-suppressor, a squelch-circuit diode and output tube delivering three watts to the speaker. A relay, which normally keeps the plate and screen voltages off the transmitter tubes can be made to close by pressing a button on the microphone handle, thus putting the transmitter in operation and at the same time cutting the voltage off the receiver output tube, preventing talk-back in the speaker. The noise suppressor circuit is so arranged that there is no sound in the

(*Continued on page* 77)



Proper equipment plus skilled hands cut down on trolley phone maintenance



Cars are side-loaded from drawhole

Coarse gob enlarges drawhole

Mine Gob from Old Stopes

How Day Mines, Inc., Recovers Lead-Zinc Ore from Monitor Unit

By ROLLIN FARMIN
General Mines Superintendent
Day Mines, Inc.

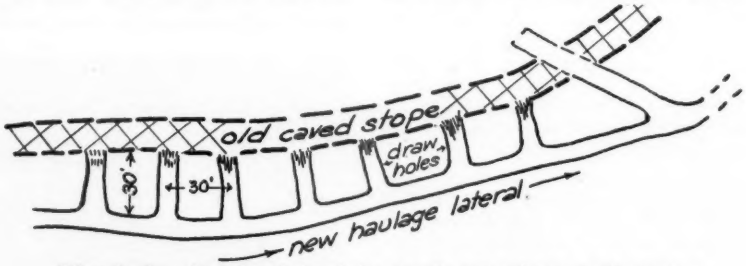
THE Interstate-Callahan Mine, Coeur d'Alene District, Idaho, was an outstanding producer of high-grade zinc-lead-silver ore in the 1915-23 period. Between 1923 and 1940, the mine was closed save for intermittent and desultory leasing operations. When World War II revived demand for zinc and lead, lessees attacked surface dumps of low-grade vein material that had been rejected by hand-sorting during the original mining operation. Next, they turned underground to the old timbered stopes, which had been backfilled with development waste and with rejects from hand-sorting in the stopes. This material, locally called "gob," contained enough zinc and lead to support several leasing operations during the war period.

In August 1945, the Interstate-Callahan Mine was acquired by the Day interests and during the next two years it was re-entered, unwatered and connected by new openings to neighboring mines. Several mines were merged to form the Monitor unit of Day Mines, Inc., feeding a central mill on Beaver Creek, ten miles north of Wallace. The gob in the Interstate stopes appeared to be a potential source of additional mill feed, in the light of the former leasing results. It was known to the Day management that the old Interstate-Callahan mine had produced about 1,000,000 tons of ore, averaging about 6½ percent lead and 21½ percent zinc. This remarkably high standard of mining grade had been maintained only by vigorous hand-sorting in the stopes. Much of the productive period was under the incentive of high metal prices and the pressure of World War I demands. Thus it was reasoned that the gob should contain rejected "ore" of fair grade, development waste, development "ore" of low grade and the high grade fines from blasting sphalerite and galena ore. Therefore, Day Mines, Inc. decided to start experimental mining and milling of the Interstate gob.

Gob Mining Presents Problems

The old stopes of the Interstate-Callahan mine are steep-dipping, about 10 ft in width and 1000 ft long. They were stoped upward, in 200-ft lifts, from timbered drifts in the ore. During 1946-47, several lengths along these old drifts were recaptured by the slow, laborious spiling method until it became evident that the old drift and stope timbers had rotted and allowed the stope filling to cave to the track. The material encountered contained several percent of zinc-lead, and was milled as ore. Attempts were made to place chutes in the newly-spiled drifts and to draw the gob downward through them into cars; but large boulders and broken timber proved troublesome. Moreover, a serious hazard to the crew would have resulted had large openings developed overhead as drawing progressed. A different method of operation clearly was needed.

In the summer of 1949, as a result of falling metal prices mining elsewhere in the Monitor unit was stopped thus permitting the exclusive use of the 450-ton concentrator for a large-scale mill test of the gob, to determine whether its metal content would permit profitable extraction. This question had remained in doubt while the gob was mixed with richer ore from adjoining mines. A new method for drawing the gob from the old stopes was devised which gave promise of being efficient and relatively safe.



Offset haulage lateral and drawholes permits safe mining of old stopes

New Method Devised

A haulage lateral is driven parallel to the line of old stopes, offset about

30 ft into the hard country rock alongside of the stopes. At 25-ft intervals along the lateral, "T" crosscuts are driven at right angles into the side of the old stope, to serve as draw holes for a mechanical shovel-loader. The shovel operates in the crosscut, at right angles both to the stope and to the train of cars in the lateral. Each car is sideloaded as it is pulled into position behind the shovel. No switching is required. The throat of a drawhole gradually wears larger from use and may require restriction with rails. Many large boulders and rotted stope timbers are mixed with the gob, necessitating frequent on-shift blasting to free blockages and to reduce oversize. The blasting which is done by bull-dozing or mud-capping, requires about one-quarter lb of powder per ton of gob. High-pressure water sprays and a strong ventilation current are used to combat smoke and dust.

Small Crew Required

Three men comprise the contract work crew: a shovel operator, a train man and a grizzly man.

The shovel operator loads the train of cars and remains near the draw point during the haulage trip, blasting boulders, freeing hang-ups, servicing equipment, etc. The train man spends most of his time in the locomotive cab, spotting cars for loading or dumping and hauling them between terminals. The grizzly man dumps the cars, then disposes of the old timber and breaks the oversize boulders through the 10-in. grizzly while the train man returns to the draw point for another train load. Splitting the train is not desirable because the time required for blasting, smoke clearance and maintenance of track and shovel keeps the shovel operator busy during the haulage interval.

The mechanical shovel used is an Eimco 21, with a 12B as a standby. They work on 56-lb rails in the drawhole crosscuts. Under the severe service hard-surfaced wheels have proved necessary. The ore cars are Coeur d'Alene Hardware & Foundry's 45-cu ft, Ajax type, side-dumping. A train of ten or twelve is drawn on 24-in. gauge track by a four-ton Mancha battery locomotive. An extra battery is used during three-shift operation. A light portable turntable permits the mechanical shovel to be moved from one crosscut to another on its own power, through two 90-deg. turns in the track.

The "point of delivery" for the gob crew is an ore pass in the Amazon mine, where it is dropped 800 ft vertically, past four intermediate levels, to a haulage adit at mill elevation. All but two of the intermediate transfer chutes were removed for the test run on the gob. On the mill-level adit, the gob is loaded into 50-cu ft Ajax side-dumping cars and hauled 6700 ft to the mill.

Portable turntable lets shovel move under own power

Gob-Mining Test Run

During the autumn of 1949, a large scale mining and milling test provided the following information on costs:

EXPENSE PER DRY TON MILLED
(22,043 tons)

Milling	$1.45
Freight on Concentrate	.09
Underground Labor	.71
Surface Labor	.24
Supervision	.20
Engineering	.04
Timbers	.01
Explosives	.11
Misc. Supplies and Expense	.10
Power	.09
Insurance and Taxes	.08
Trucking	.08
Total Expense (excluding administrative)	$3.20

COMPOSITE METALLURGY OF THE TEST RUN

	Tons	Assays Ag Ounces	Assays Pb Percent	Assays Zn Percent	Recoveries Ag Percent	Recoveries Pb Percent	Recoveries Zn Percent
Feed	22,043	.5	1.2	2.3	100	100	100
Lead Conc.	255	18.2	58.8	11.1	39	59	6
Zinc Conc.	923	3.2	7.5	43.3	25	27	80
Zinc Tails	20,864	.2	.2	.3	36	14	14

Wood Dust Complicates Milling

In treating freshly broken Monitor mine ore, a normal grinding and flotation circuit is used. The ore is crushed and ground to 3 percent plus 65 mesh, 66 percent minus 200 mesh. It then goes to lead flotation cells. The lead cell tailing proceeds directly to the zinc flotation circuit.

The principal difficulty found in concentrating the gob-ore by customary lead-zinc flotation arises from the large amount of rotted wood dust that it contains. This wood pulp is too finely divided to be separated on the vibrating screens and is too water-soaked to float in the classifier pool. Therefore, it is ground until it escapes the circuit with the classifier overflow pulp. Upon reaching the lead rougher cells for flotation, the wood pulp "boils off" in a foaming froth which is low in metal content, is non-selective in action, yields a low-grade mixed concentrate and leaves a high lead tailing. Subsequent zinc flotation is not adversely affected because the wood pulp has been removed with the lead flotation concentrate.

As a result of the information gained during the test run, a washing circuit has been added to combat the wood pulp. The crushed ore (—⅝ in.) is fed into the pool of a rake classifier and is sprayed with dilution water where the rake lifts from the pool. The rake discharge provides feed for the subsequent primary grinding circuit; the overflow water from this washing classifier removes the wood pulp and is pumped to the waste tail race ahead of the final sampling point. The small amount of lead and zinc minerals contained in the wash water is trapped in a hoppered tank 5 ft by 5 ft by 4 ft in size, and is spigotted into the first lead rougher cell.

In the present operation (autumn 1950) the treatment outlined above yields the following improved recoveries:

Lead recovered in lead concentrate	78%
Zinc recovered in lead concentrate	4
Lead recovered in zinc concentrate	20
Zinc recovered in zinc concentrate	91
Over-all lead recovery	98
Over-all zinc recovery	95

Acknowledgments

The writer is indebted to Henry L. Day, president of Day Mines, Inc., for historical data, for critical reading, and for permission to publish this article. Carville E. Sparks, general mine foreman, assisted greatly in working out the mining details; the milling data were furnished by L. A. Grant, general mill superintendent and R. C. Johnson, mill foreman.

Forty-Ton Coal Haulers At Harmattan Mine

Show Definite Advantages Over Smaller Units

By L. E. BRISCOE and ALAN S. McCLIMON

Electrical Engineer
Ayrshire Collieries Corp.

Manager of Sales Development
The Euclid Road Machinery Co.

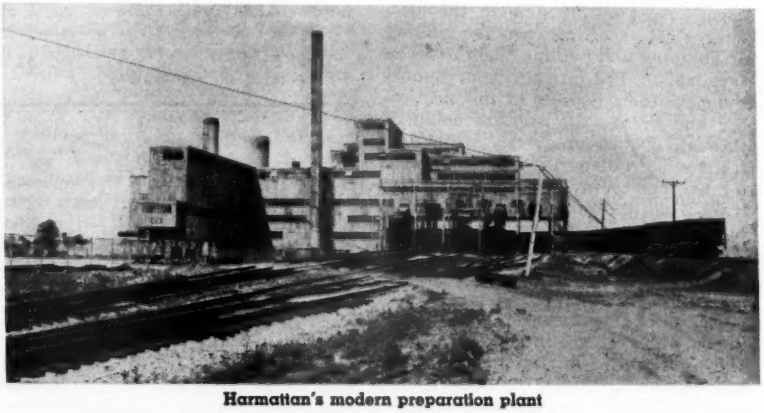
IN the broad belt of bituminous coal fields in the United States, stretching from the Ohio border to the midlands of Kansas, open pit strip mining on a large scale continues to expand. In 1946, 21.1 percent of bituminous coal and lignite was mined by open pit methods, and this was increased to 24.2 percent in 1949. In the period between January 1948, and December 1950, 97 strip mines with a capacity of 1000 tons per day or more were opened or placed in development. One of these new, modern strip mines is the Harmattan mine of Fairview Collieries Corp., near Danville, Ill., which produced its first coal in January 1949, after a seven-year period of planning, construction and development. Fairview Collieries Corp. is one of the operating subsidiaries of Ayrshire Collieries Corp., of Indianapolis, which operates seven mines in Indiana and Illinois, and ranked sixth in annual production in 1949 among the large strip mine operators. Ayrshire Collieries Corp. operates a fleet of 60 coal haulage trucks, ranging in size from 20-ton to 40-ton capacity. The Harmattan mine is the first Ayrshire operation using 40-ton capacity coal haulers. These units have been carefully watched and compared with 32-ton and 20-ton coal haulers at the other mines to determine whether a large capacity hauler gives a lower cost per ton, or if there is a point of diminishing economic returns.

Harmattan mine has an estimated life of at least 20 years. It is a dragline operation, stripping an average of 72 ft of overburden to recover a 6—6½-ft seam of Illinois No. 7 coal. This seam is underlain by heavy, dense fireclay. Since the overburden is porous and contains two seams of water-bearing sand, and the coal lies below the water level of several small streams nearby, adequate pit drainage is most important. A 25 cu yd Bucyrus-Erie dragline with 180-ft boom, working 24 hrs a day, seven days a week, removes the overburden, which contains no rock or shale. A second dragline, a Model 1250B Bucyrus-Erie is now being assembled, and will be ready for operation in the spring of 1951. This new dragline will have a 30-cu yd bucket on a 200-ft boom.

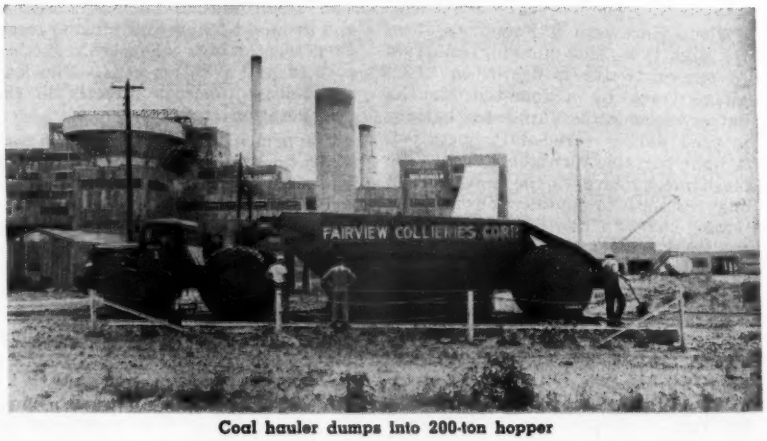
The preparation plant at Harmattan was designed for 600 tph of washed, prepared coal, but in actual operation has produced as high as 900 tph. Four Euclid 40-ton coal haulers transport raw coal from an electric powered 7½-cu yd Marion coal loader over a haul distance of 1½ miles, dumping into a drive-over hopper of 200 tons capacity at the preparation plant.

New Combination Developed

Ayrshire officials had certain guides which led to the installation of 40-ton capacity trucks, in fact, requirements dictated that a new combination be developed by the truck manufacturer; for this is the first use in coal hauling service of the large single flotation type, 27.00 by 33 30-ply tire. Since 40 percent of the coal loading takes place on fireclay, the question of traction and flotation is immediately raised. Ayrshire engineers originally proposed seven 20-ton capacity Euclid coal haulers, equipped with 21.00 by 24 single tires. Experience showed a single low-pressure tire of large cross section had greater flotation and tractive ability than two high-pressure tires of smaller cross-section with equivalent carrying capacity. From an operating viewpoint, the 20-ton unit promised satisfactory haulage on the type of fireclay at this mine, but past history showed definite savings and



Harmattan's modern preparation plant



Coal hauler dumps into 200-ton hopper

lower cost per ton-mile when the company used 32-ton trucks. But these larger trucks all were equipped with dual tires and no single tire available supplied adequate tire capacity for a 32-ton payload.

There had been widespread application of a 27.00 by 33 single tire on 25-cu yd bottom-dump earthmovers in earth fill dam construction, where flotation on soft fill is essential, and 40-ton coal haulers, equipped with 18.00 by 24 dual tires had been used by several mining companies. At Harmattan these elements were combined, resulting in the use of four Model 9LDT-104W Euclid 40-ton single-tire coal haulers, rather than the seven 20-ton machines originally proposed.

SPECIFICATIONS OF 40-TON COAL HAULERS

Model—Euclid 9LDT-104W
Engine—Cummins Model NHS, 275 HP
Transmission—Fuller 5-Speed
Front Tires—14.00x24—20-Ply
Tractor Drive Tires and Trailer Tires—27.00x33—30-Ply Single
Trailer Capacity—47 cu yd, Struck Measure
Net Weight, No Load—61,900 lbs
Over-all Length—50′ 7½″
Over-all Width—10′ 8″
Top Speed—25 MPH

Try Fluid Drive

One-way haul distance at Harmattan will eventually reach four miles and additional trucks will be installed as the length of haul increases. A fifth haulage unit has just recently been placed in service and is equipped with a new development which is creating much interest and comment in all fields of off-highway haulage: the Torque Converter.

This latest unit is equipped with a 300-hp Cummins Model NHRS engine, Allison torque converter and hydraulically-actuated Allison torqmatic transmission, rather than the 275-hp Cummins engine and conventional five-speed transmission. Engine horsepower was increased better to match the design characteristics of the torque converter. The Allison converter and 3-speed planetary type transmission are well liked by the drivers, since shifting can be accomplished easily by merely moving a shift lever from one position to another without let up on the throttle.

Driver fatigue is greatly reduced as there is no clutch pedal or conventional gear shift lever to operate. Engine speed remains practically constant, and the diesel engine is not subject to harmful "lugging" at low rpm as is the case with the standard transmission if the operator fails to shift properly. There is a continuous power flow to the rear axle, with no loss of power due to declutching, such as occurs with a clutch and transmission. Since the torque converter exactly matches the horsepower requirements to go up grades, or haul over a soft roadway in the pits, the driver is always efficiently using all of the net horsepower available at the drive wheels to get higher road speeds. The torque converter unit may be expected to have better performance and lower cycle time in pits having variable grades or road rolling resistance.

Single 27 by 33 tires give adequate flotation and traction

Initial and Operating Costs Higher

However, these benefits are not without cost. The increase in engine horsepower from 275 to 300 hp adds about $750 and the Allison converter and transmission add about $2880, so that initial investment per truck is an additional $3630, or about 10 per cent.

Early records show that fuel consumption per hour is higher with the 300-hp engine and the torque converter, averaging 8.75 gal per hr compared to 5.83 gal per hr for the original trucks. However, the torque converter unit is being loaded with an extra pass from the 7½-yd loading shovel, so that it is hauling more tons of raw coal per load and per hour. Cycle time comparisons on a 1½-mile haul to the tipple, including 0.4 mile in the pit and on the fireclay, 0.8 mile on a well-maintained haul road with grades from 0 — 4 percent and 0.3 mile on a permanent ramp having an adverse grade of 3 — 4½ percent are shown below.

Average speed of the 17LDT-118W was somewhat slower during this period of observation because of the larger payload being handled. However, the converter unit hauled 8½ percent more tons of raw coal per shift.

The new truck permits a direct comparison between converter and transmission units, and cost and performance records are being carefully kept to determine if the converter has advantage in performance, driver comfort and low-cost maintenance.

Euclid Model	9LDT-104W	17LDT-118W
Type of Power	275 hp—5-Speed Transmission	300 hp—Allison Torque Converter
Capacity—Struck Measure	47 cu yds	55 cu yd
No. of Passes from 7½-yd Shovel	Six	Seven
Loading Time	2.07 Min.	2.40 Min.
Haul from Shovel to Hopper	5.71 Min.	6.28 Min.
Dumping Time	.14 Min.	.14 Min.
Return Empty from Hopper to Shovel	4.74 Min.	4.87 Min.
Delay Time at Shovel	.94 Min.	.94 Min.
Total Cycle Time	13.60 Min.	14.58 Min.
Trips per sixty-minute hour	4.4	4.13
Trips per 7¼ Hour Shift	32	30
Tons of Raw Coal per Shift, 1 Truck	1300 Tons	1410 Tons
Average Road Speed, Loaded	15.7 mph	14.3 mph
Average Road Speed, Empty	19.0 mph	18.4 mph

The Harmattan coal haulage fleet has established a record of 345 tons of raw coal hauled per mile, per operating hour, which is the highest of any of the Ayrshire mines. This "Operating Index" is considered by Ayrshire operating heads to be of prime importance within the 60-odd production and cost figures which are reviewed each month at the home office in Indianapolis. While the monthly records on maintenance and cost per ton-mile may vary from month to month depending on tire replacements, engine overhauls, and other such intermittent costs, the Operating Index remains fairly constant and any significant change in this figure is a matter calling for investigation.

Good Roads Essential

The high Index Figure at Harmattan is due not only to the 40-ton capacity haulers, but also to the well-maintained haul roads which permit high average travel speeds. Specialized equipment, in daily use for haul road maintenance, includes a Caterpillar Model D8 bulldozer for work in the pit. On temporray haul roads, a Caterpillar No. 12 motor grader is used for blading and to maintain crowned roads for drainage. A 4000-gal sprinkler trailer is used to wet down the haul roads on dusty days.

Permanent haul roads are built with a base of plus 1½-in. mine refuse, spread to depths of 18 in. to 3 ft. Then, plus 2-in.—4-in. crushed limestone is spread 6 — 8 in. deep, and bound in by truck traffic. The final road surface is covered by minus 1¼-in. limestone. All roadways have a 60-ft base including gob and clay shoulders, with a 40-ft finished road surface of rock. The stone is purchased locally from a quarry about 15 miles from the mine and is hauled in and spread by light highway trucks.

Temporary haul roads in the pit are built if the trucks will be running over the fireclay for any long period of time, perhaps several months. River gravel is spread on the fireclay to keep the road from becoming slick, permitting better traction for the coal haulers. If the haul on fireclay is of limited duration, the pit road is only graded and drained.

The fireclay underlying the No. 7 Illinois seam is firm, and stands up under haulage units. Most mine pit roads "cut out," or rut when wet, but the fireclay at Harmattan does not squeeze out or flow beneath the 27.00 by 33 tire. These tires have a kneading action on the clay. This dries up a wet haul road very rapidly, compacting it into a hard, dry surface. As mentioned previously, the pits are kept well-drained by adequate ditching and portable pumps.

Well prepared and maintained roads are the rule at Harmattan

Mine Yield High

The pits are stripped to a width of 120 ft, and coal is taken out in three cuts of the loader, the length of the pit. Because of a tendency of the bank to slough off, the loader takes the first cut 40 ft wide along the highwall. On this cut the trucks drive in on the fireclay in the excavated portion of the pit, up an incline onto the coal, then turn and pull in under the loading shovel on the center of the coal. On the second loader cut, the trucks come in on the fireclay, turn on the coal, and load on top of the coal. On the third loader cut, the trucks are on the fireclay continuously, both loaded and empty. Fast loading time is maintained by the shovel since a bulldozer cleans up the spillage from trucks and on pit clean-up, 'dozes loose coal to the shovel for loading.

Modern open pit coal mining permits a very high rate of recovery, and the industry has many examples of reclaiming coal from older underground workings or from strip fields which had been worked with small draglines and shovels, leaving large amounts of coal which can be economically mined with present-day equipment. Of the coal which is uncovered at Harmattan by stripping, 94 — 98 percent is loaded into trucks. Of the raw coal hauled to the tipple, about 80 percent goes into the rail cars as washed, graded and prepared coal ready for shipment. The remaining 20 percent is refuse, or gob.

The total cost per ton mile shown above does not include social security

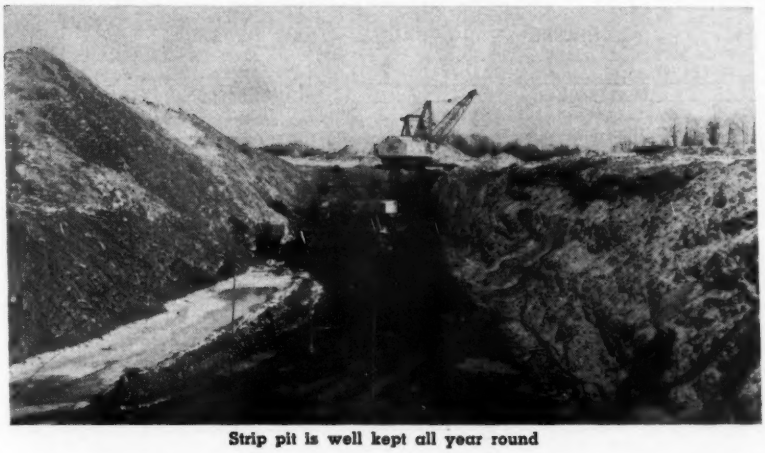
OPERATING SUMMARY

(May 1—October 30, 1950)

(1)	Operating Index (Raw Tons of Coal Hauled per Mile-per hr)	345
(2)	Average Tons per Load	36.2 Tons
(3)	Average Round Trip Distance	2.32 Miles
(4)	Miles per Hour of Coal Service	9.46
(5)	Hours of Coal Hauling Service, Fleet of Four	96.9 Percent
(6)	Hours of Operating Delays, not Chargeable to Trucks	2.9 Percent
(7)	Hours out of Service for Repairs	.2 Percent
(8)	Diesel Fuel, Miles per Gal, Average	1.62
(9)	Engine Lubricating Oil, Qt per 1000 Miles	41.7 Qt
(10)	Grease, Lb per 1000 Miles	7.37 Lb

COST SUMMARY

	Operating	
(11)	Drivers' Wages	$ .0071 Per Ton Mile
(12)	Diesel Fuel	.0020
(13)	Lubricating Oil	.0002
(14)	Grease and Miscellaneous	.0001
(15)	Total Operating Cost	$0.0094
	Maintenance	
(16)	Mechanics' Wages	.0056
(17)	Supplies, Ordinary Maintenance	.0003
(18)	Supplies, Major Repairs	.0004
(19)	Tires and Tubes	.0003
(20)	Total Maintenance and Repair Costs	$0.0066
(21)	Total Cost per Ton Mile	$0.0160



Strip pit is well kept all year round

and workmen's compensation, depreciation on haulage equipment, fixed charges and overhead assessed against mine haulage. Truck depreciation is set at 20 percent per annum, with complete write-off in five years.

Operating and Cost Summaries Analyzed

Item 1. Operating Index

A review of the Operating Index for the same six-month period at the other Ayrshire mines shows figures of 107, 152 and 165 for three mines using 20-ton coal haulers, and figures of 232, 294 and a maximum of 328 for three mines using 32-ton coal haulers. Comparison of the best index figure within each tonnage class shows an increase of almost 100 percent in the tons of raw coal hauled per mile, per hour, for the 32-ton machines over the 20-ton haulers. However, the increase in the index figure of 345 at Harmattan over the figure of 328 for 32-ton coal haulers is only about 5 percent.

In other words, mine records show that installation of 32-ton units compared with 20-ton units (a gain of 60 percent in payload) results in approximately 100 percent increase in raw tons of coal hauled per mile per hour, whereas a comparison between 32-ton and 40-ton haulers (an increase of 25 percent in payload) results in an increase in operating index of about 5 percent.

This would indicate that the point of diminishing returns is fast being approached. As has been pointed out in a paper on Strip Mine Truck Haulage in the April 1948, issue of MINING CONGRESS JOURNAL, large trucks give a lower cost per ton. Figure A is a reprint of chart prepared for that article, showing Gross Coal Haulage Cost per Ton-Mile, as estimated for various haul distances with the 20-ton and 32-ton coal haulers, based on Ayrshire Collieries Corp. operating experience at that time.

It is always interesting to compare estimates with actual results, and Ayrshire cost summaries of six months in 1950 show a definite correlation with the estimates of 1948.

The dotted lines show actual cost per ton mile, over the average round trip haul distance, recorded by those Ayrshire mines using 20 and 32-ton haulers. Note that cost per ton mile of the 40-ton hauler will fall on a curve below the 32-ton machine, but does not show as much savings as the improvement between the other sizes.

The cost estimate curves and actual curves are not directly comparable, as the 1948 estimates include overhead and depreciation which are not a part of the 1950 operating summaries, and no adjustments have been made for the higher hourly rate paid truck operators since 1948.

Item 2. Average Tons per Load

The Operating Index at Harmattan should improve in the next six-month period, as sideboards are being added to the original 47-cu yd trailers to raise the present average of 36.2 raw tons per load. The latest trailer delivered has a struck measure capacity of 55 cu yd and a heaped capacity of 63 cu yd.

Item 3. Average Round Trip Distance

Harmattan mine averages 2.3 miles per round trip haul. So far, the longest haul has been about 3 miles round trip.

Item 4. Miles per Hour of Coal Service

The figure of almost 9½ mph average road speed, including delays, loading and dumping, is the highest of any Ayrshire fleet—which is surprising, since some of the other mines have a longer haul distance which would favor a high average speed. This is an indication of the better performance, and power-weight ratio which is being provided in modern haulage equipment.

Items 5, 6 and 7. Hours of Service

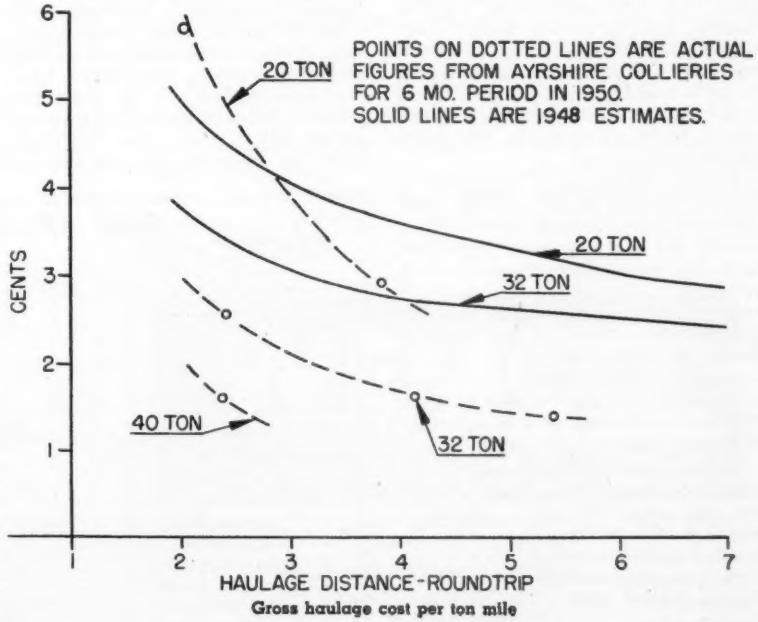
Truck availability has been very high, with only 0.2 percent down time being charged against the fleet of four during a six-months' operating period.

Item 8. Diesel Fuel Consumption

Average fuel consumption throughout a six-months' period gives 5.83 gal per hr for the Cummins NHS 275-hp engine, 3.24 gal per hr for the Cummins NH 200-hp engine, and 2.4 gal per hr for the Model HB6 Cummins 150-hp engine, used in the 40-ton, 32-ton, and 20-ton coal haulers, respectively.

Item 9. Engine Lube Oil, Qt per 1000 Miles

This is another key figure in the operating summary, since it indicates



Gross haulage cost per ton mile

the condition of the diesel engines. An increase in lube oil used per 1000 miles shows that the engines are burning oil and are approaching need for overhaul. Oil is changed every 12 shifts, or approximately 90 operating hours and lube oil filters are replaced at every third change. Regular laboratory oil analyses are made, as a guide to oil change periods and as a check on engine condition.

Item 11. Drivers' Wages

Drivers are paid the regular union contract rate of $2.20 per hr for 7¼ hr per shift, or 43 percent of the total operating and maintenance cost per ton mile.

Item 19. Tires and Tubes

Only two of the large single tires have been changed to permit minor repairs in the 22 months of haulage up to October 31, 1950. Measured wear on the drive tires is ½ in. off the tread in 1900 hr operation. There is no measurable wear on the trailer tires, which have not yet been rotated to the drive axle of the tractor. While total operating life is not yet known, it appears that the tires will exceed the 4500-5000 hr life which was anticipated, and may go even higher than expected as there is no evidence of cutting or wheel spinning. The tires used are Goodyear 27.00 by 33 30-ply All-Weather Tread. Originally, each tire cost $1661.80, but increased costs of crude rubber now brings the replacement cost per tire to $2500. A record is kept of each tire, by serial number, showing the total hours of service, wheel position and repair costs throughout its entire service life.

Shop and heated storage space is provided for future expansion in the truck fleet. The garage is 64 by 100 ft, divided into four 16-ft bays, which allows plenty of working space around each unit for preventive maintenance inspection and lubrication. Additional space, 32 by 50 ft is set aside for repair bays, adjacent to the parts supply room.

Fuel is delivered as required by truck transport to an 8000-gal storage tank above ground. Fuel is then gravity fed to a 1500-gal underground tank, then pumped into the trucks. All refueling is done at the shop to avoid contamination of the diesel fuel by dust and dirt. Some 300 gal of diesel fuel are used each day in all types of equipment. The 8000-gal tank was installed to get the benefits of bulk fuel prices, and to add reserve fuel storage capacity.

Machine shop facilities can handle any major repairs, and include a welding and blacksmith shop. Maintenance of all rolling equipment is handled by one mechanic on the day shift, and one mechanic and a helper on the second shift. The two mechanics are highly trained in diesel maintenance, being former field service men for an engine distributor. They are responsible for preventive maintenance, and repair of some 19 major units:

- 5 Euclid coal haulers
- 4 Caterpillar D-7 and D-8 bulldozers
- 1 Caterpillar motor grader
- 1 Mack winch truck
- 1 Dodge power wagon
- 1 ½-ton pick-up truck
- 1 sprinkler-tractor-trailer
- 1 IHC 1½-ton dump truck
- 1 Euclid 13-yd bottom-dump
- 1 Euclid 12-yd rear-dump gob hauler
- 2 1½-ton refuse trucks

All coal haulage units are lubricated after every two shifts, as an average, which is performed in regular scheduled sequence on the second shift. At this time, each unit is given a mechanical inspection, including such items as fan belt and radiator hose connections, clutch pedal adjustment, brake adjustment, tight wheel lugs, and leaks in fuel and air lines. Tire pressure is checked every day on the second shift, when the tires have cooled off from the day run and tire temperatures have stabilized. In cold weather, all rolling equipment is filled with permanent anti-freeze.

The day mechanic makes a check-run with the drivers each day, to check the operating condition of the truck engine, brakes, clutch, lights, instrument panel and steering. One simplified daily report is used by the driver and mechanic, forming the basis for all monthly and semi-annual operating records.

All automotive equipment at Ayrshire mines is under the general supervision of L. E. Briscoe, electrical and automotive engineer, for standardization of maintenance practices. Carl Walker is superintendent at the mine, with Roy Davis as master mechanic. Pit and haul roads are kept in good condition by George Wilson, pit foreman.

Faced with the increasing demands for coal, coupled with the economic pressure for low haulage cost per ton, strip mining operators throughout the United States are reviewing their equipment, and have added to or replaced older haulage trucks at an increased rate since June 1950. Predominantly, the 40-ton payload coal hauler is being selected.

135 REV. 2 1/50 A GEN. 260 BKS.

DRIVERS & MECHANICS DAILY REPORT

TRUCK NO. _____ MINE _____

TRAILER NO. _____ DATE _____ 19____

COAL HAULAGE	PIT NO. 1	PIT NO. 2	PIT NO. 3
NO. HOURS			
MILEAGE			
NO. TRIPS			
NO. LOADS			

OTHER HAULAGE	
NO. HOURS	
MILEAGE	
USE	
NO. TRIPS	

OPERATING DELAYS	
NO. HOURS	
CAUSE	

FUEL & LUBRICANTS		
FUEL	GALLONS	
OIL	QUARTS	
GREASE	POUNDS	

DRIVER _____

REPAIRS NEEDED

REPAIRS MADE

NO. HOURS

TIRE CHANGES	WHEEL	WHEEL	WHEEL
TIRE NO. REMOVED			
TIRE NO. APPLIED			
NEW OR USED			
SPEEDOMETER			
REASON			

MECHANIC _____

FORM NO. 311

AYRSHIRE COLLIERIES CORPORATION AND SUBSIDIARIES

COAL TRUCK RECORD

TRUCK SERIAL NO. _____ MINE _____

TRAILER NO. _____ MONTH _____ 19____

DAY	COAL HAULAGE SERVICE NO. HOURS	MILEAGE	TRIPS	LOADS	OTHER SERVICE NO. HOURS	MILEAGE	OPERATING DELAYS NO. HOURS	REPAIRS NO. HOURS	FUEL GALLONS	OIL QUARTS	GREASE LBS.
1											
2											
3											
4											
5											
6											
7											
8											
9											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
TOTAL											

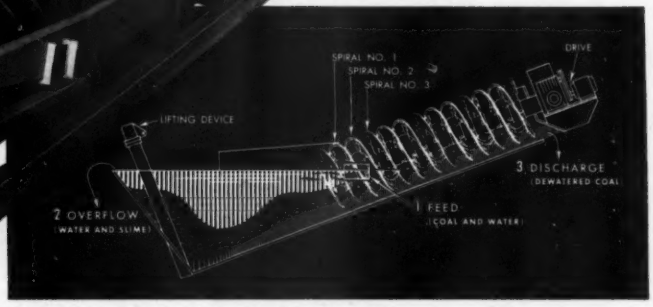
NOW

DEWATER FINE COAL AT LOWER COST

WITH

WEMCO COAL SPIRALS

Serving the same functions as settling type tanks of far greater mechanical complexity, WEMCO COAL SPIRALS are simpler, less expensive machines used in a variety of coal preparation applications.



Simple operating principle

1. Feed (coal and water) enters the side of the tank; 2. water overflows carrying slimes, and 3. coal settles in the tank and is conveyed up the incline with a turning squeezing action to eject and drain free water.

Balanced capacity

WEMCO COAL SPIRALS provide a balanced settling operation, combining a large settling pool with a high capacity spiral raking mechanism.

Low operating costs

WEMCO's simply mounted spiral shaft contrasts sharply with the innumerable wearing points in the links, chains, pivots, drive sprockets, etc. in other machines. As a consequence, power and maintenance costs are greatly reduced.

A size for every need

A choice of various spiral diameters, pool sizes, and spiral designs are combined to provide correct machines for a wide range of conditions and requirements. **WEMCO COAL SPIRAL** capacities vary with size—dewatering up to 6,000 g.p.m. at 28 mesh (1,500 g.p.m. at 65 mesh)—conveying up to 240 t.p.h. (¼" x 0" coal, sp.gr. 1.8).

DEWATERING AND DESLIMING

- *Pea, buckwheat, rice, and barley coal or refuse*
- *No. 4 and No. 5 buck coal or refuse*
- *Coal or refuse, 65 mesh to 1½ inch*
- *Table feed*
- *Heavy density fines*
- *Fine coal feed to froth flotation*

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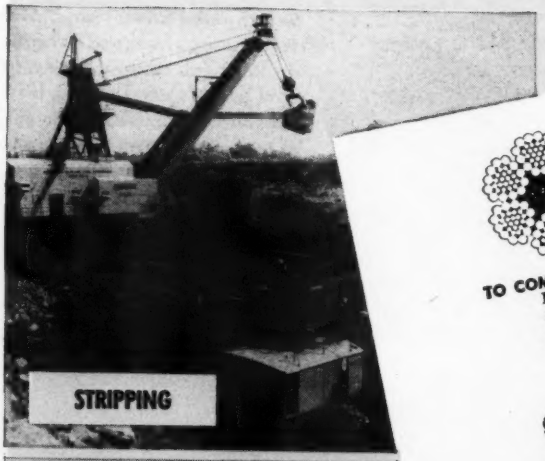
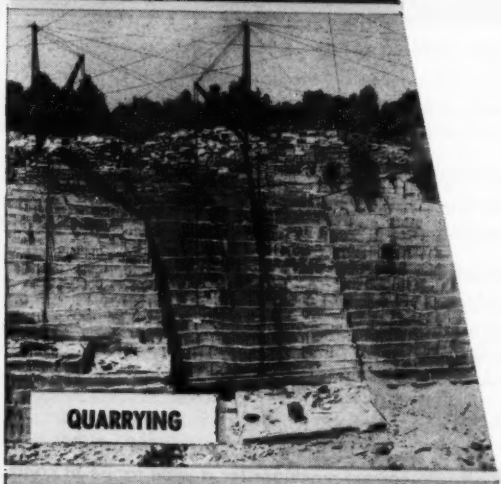
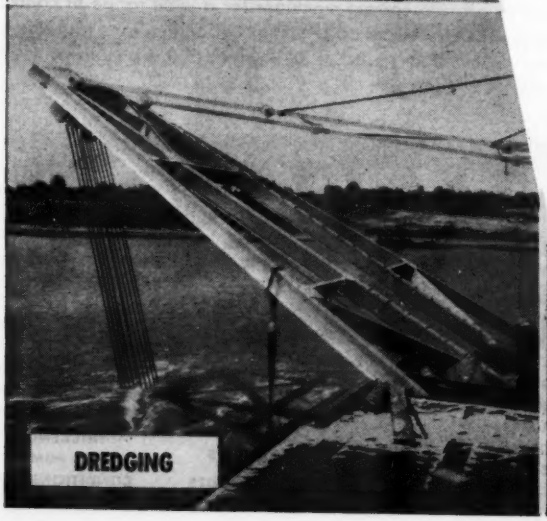
FAGERGREN LABORATORY UNITS
HYDROSEPARATORS
HMS LABORATORY UNITS
DEWATERING SPIRALS
AGITATORS
SH CLASSIFIERS
THICKENERS
SAND PUMPS
CONDITIONERS

Is your competitor







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TO COMBAT FATIGUE Tiger Brand 6x37—Type S Excellay Preformed. This rope is listed as "Special Flexible Hoisting Rope" and is also known as "Crane Rope." It is the most flexible of standard constructions which permits its use with small sheaves and drums. Its reserve strength is highest of the standard constructions.

FOR RESISTING CRUSHING Tiger Brand 6x19 Seale Patent Excellay Monitor Preformed IWRC. Here's a rope that is widely used where resistance to crushing is necessary. It stands up under heavy abrasion, yet has sufficient flexibility for winding on medium sized drums.

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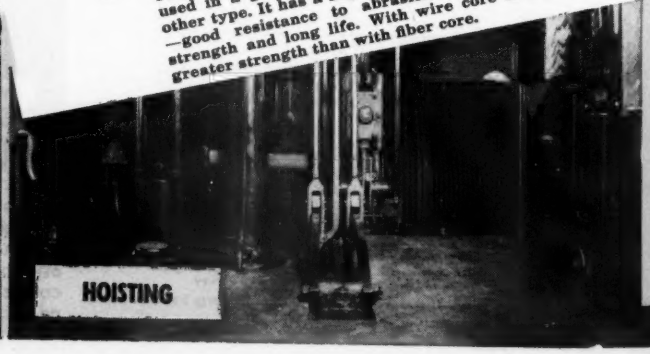

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You may be paying double his wire rope costs unless you follow a few simple rules

The wrong wire rope on a job where abrasion or fatigue is severe has been known to cut service life in half . . . and careless handling or just plain abuse will result in similar short service. To get the best wire rope for your job, you should consider these four major requirements carefully—

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2. **Does it have the ability to withstand repeated bending without failure of the wires from fatigue?**
3. **Will it withstand abrasive wear?**
4. **Can it take crushing?**

A proper choice is made by correctly estimating the relative importance of each quality and selecting a rope that has the best combination of properties for your application.

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UNITED STATES STEEL

Butte mine water drops copper as it flows over shredded cans in open launders

New Precipitation Plant at Butte

Anaconda Recovers Copper from Mine Water

By A. C. BIGLEY
F. F. FRICK
M. McCANNA
J. P. RYAN
Anaconda Copper Mining Co.

ANNOUNCEMENT of the Greater Butte Project by C. F. Kelley, chairman of the board of directors of the Anaconda Copper Mining Co., in September 1947, inaugurated the planning of a new copper precipitation plant at Butte, to replace the old and obsolete High Ore and Leonard precipitation plants. Grading for the new plant started in July 1948. On September 8, 1949, 2000 gallons of water per minute were by-passed to this plant; and on November 3, 1949, the entire flow from the High Ore central pumping plant was diverted to the completed plant.

In the Butte mines, copper and iron sulphides are oxidized, with the formation of copper sulphate, iron sulphate, and insoluble basic iron sulphates. These, together with more or less ore slime, are found in the mine water pumped to surface. The principal reaction which occurs is the precipitation of metallic copper at the expense of metallic iron and can be expressed by the equation:

$$Fe+CuSO_4=FeSO_4+Cu$$

The ferrous sulphate is oxidized by aeration in the flumes and launders to ferric sulphate; and being subjected to still further oxidation, is precipitated out of solution, as basic ferric sulphate and ferric hydrate, with the liberation of free acid, which reacts upon either copper or iron and again forms sulphates.

The first precipitation of copper on iron in Butte started on a small scale—about 1890. In later years the two large precipitation plants were the High Ore and Leonard.

The High Ore plant, using rails and miscellaneous scrap iron and hand methods to clean the copper from the iron in the launders and towers, gave good extraction but was very costly.

The Leonard plant was more modern and largely mechanized. An electric crane, operated from a third rail, was equipped to move or charge rails and scrap iron into the launders with a magnet, or to load cement copper with a grab bucket from the settling tanks to the tank cars. The cleaning of copper from the iron was still performed by hand. In 1939, shredded tin cans were tested. After a few years, hydraulic slushers were perfected and the entire plant was charged with shredded tin cans. With the results obtained at this plant, it was realized that when a new plant was built it should be mechanized 100 percent to eliminate hand labor and high costs.

Butte mine waters present some unique problems. There is a very large tonnage of water, very low grade in copper, and containing a considerable amount of solids in suspension.

About 30,000 tons of mine water are pumped per day, containing about .03 percent copper, also .75 percent solids in suspension. The total iron amounts to about .05 percent, three-quarters of which is in soluble form. About 90 percent of the soluble iron is in ferric form.

In general, there are two ways to precipitate copper from mine water, in tanks and in shallow launders. Iron materials used are rails, scrap iron, and shredded tin cans, or scrap resulting from the making of tin cans.

The solids in Butte mine water are locally known as "ocher" and have the characteristic yellow color of commercial ocher. However, about half

to two-thirds of the solids consist of ore slime.

To choose a precipitation method for the new plant required considerable study and research work. The use of shredded tin cans and scrap iron was finally decided upon because shredded tin cans could be depended upon as a source of iron. To mechanize the new plant 100 percent, the shredded tin cans admirably fitted into the plans. Long experience in Butte and considerable research led to the choice of the launder plant. The new plant was designed and constructed by the Butte mechanical department of the Anaconda Copper Mining Co.

Description of the Plant

Butte mine water is pumped at the High Ore central pumping plant by plunger and centrifugal pumps to the 300-ft level of the High Ore shaft, where it flows by gravity through a tunnel. A location north and east of the portal was selected as a site for the new plant, where it can be serviced by railroad, power, and other facilities.

In order to conduct the water to this site, it was necessary to flume it a distance of 3700 ft from the portal, with a drop of 160 ft. The flume, en route, passed under three railroad tracks and a county road.

The flume is built of splined lumber, open at the top, four ft wide by one ft deep. It had to be designed to handle a flow equal to the entire pump capacity of the High Ore 1200 level. Inasmuch as the flow is at times greatly reduced, the flume's sideboards were made one board high to avoid an intermittently unwetted joint. The side posts are high enough so that additional six-in. sideboards can be placed where needed to handle any conceivable flow. The flume top is entirely open to facilitate removal of the troublesome deposit of "ocher," which builds up along the sides and bottom. A minimum flume-grade of one percent was adhered to, except as later noted.

At a distance of 2000 ft from the High Ore portal and 106 ft below it, two settling basins were excavated into the hillside, producing a settling area of 21,000 sq ft. Each measures at a median line 70 ft by 150 ft by eight ft deep. These ponds are cut into the terrain and do not have any earth-filled side walls. The sides of these tanks were flatly sloped, the corners rounded, and lined with three — four in. of concrete, lightly reinforced. Their shape immediately caused them to be dubbed the Rose Bowls. A five-sided shallow tank, with adjustable flash-board outlets, was installed to act as a splitter for the water to apportion an optional amount to each settler, with minimum attention. The spillway of each bowl consists of a concreted channel, the full depth of the bowl, equipped with flash boards which makes it capable of being decanted gradually by cutting off the inflow and removing the narrow flash boards at considered intervals.

The purpose of these bowls is to provide a settling area for a considerable amount of "ocher." At a junction point below the bowls, one flume was brought into the other at a higher elevation and so arranged that the waters could be enjoined; or by an arrangement of flash boards, the water or "ocher" washings from one or the other could be diverted into a secondary flume of smaller cross-section, running parallel with the main flume. It is through this flume that "ocher" can be hydraulically flushed from either bowl, while all copper-bearing water is being passed through the other "ocher" is dumped into a suitable area west of the creek.

The site selected for the plant was on high ground above the east bank of Silver Bow Creek; and in order to feed the plant at the required height, yet pass under the county road on the west slope, a grade of only one-half of one percent was allowed on the flume crossing the valley. This flume is supported by a timber trestle, having a maximum height of 27 ft and an over-all length of 1150 ft. Trestle bents are spaced at 16-ft intervals, supported on capped piles, except at the creek crossing, where a 36-ft trussed flume bridge is employed.

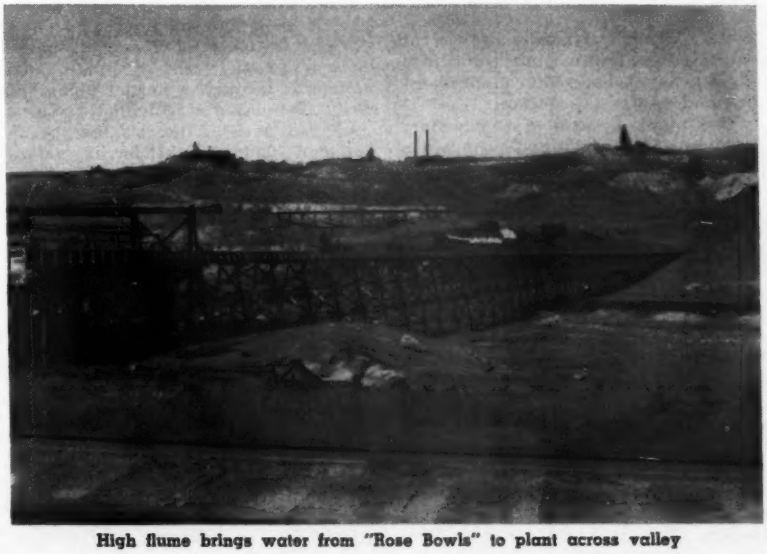
The site, adjoining a railroad right-of-way, required the leveling of an area 1300 ft by 180 ft. A generous sized channel also was cut and graded parallel with and east of the main line railroad, and bridged by both the track and an approach road to the plant. The purpose of this was to handle the runoff from any abnormal rainfall over a large acreage draining to that area from the west slope of the Continental Divide.

The plant consists of six parallel wooden launders, each eight ft wide and two and one-quarter ft deep by 500 ft. They are laid on a downgrade of two percent, and are separated into five sections of 100 ft each. At the end of each section is a cement-copper drop tank of concrete partitioned into six compartments, and measuring over-all 21 by 62 ft and a minimum of 12 ft deep, inside dimensions. Before and after each drop tank is the equivalent of a two-ft wide transfer launder. Each launder and drop tank compartment is provided with slots for flash boards, permitting the isolation of any launder or drop tank section and transfer of water to one or the other side, at the will of the operators.

There is a narrow catwalk atop each partition separating the launders; and along the centerline of the whole structure is an eight-in. by two and one-quarter ft deep flume, to accommodate and flood the suction foot piece of a cement-copper flushing machine.

The launders are built of three-in. splined lumber, laid lengthwise of the course, supported by 6 by 6-in. floor joists, which are laid across 8 by 12-in. stringers, suitably spaced and spanning the 10-ft gap between timber bents. These bents consist of seven 12 by 12-in. posts, at 10-ft centers, capped with timbers of the same size and resting upon an equal number of continuously capped piles. These piles were treated against rot before driving, and were driven by a drop hammer to minimum penetration. The bents were braced both laterally and longitudinally. The posts, against which the launder sides were laid, were stoutly bolted through both joists and stringers, to make the whole structure resistant to the abuse of a crane-operated magnet weighing three tons.

The width of this launder structure,



High flume brings water from "Rose Bowls" to plant across valley

including a walkway along each side, is 69 ft over-all. Alongside this, a spur from the railroad was laid the whole length of the plant. On this track are brought the gondolas, loaded with iron scrap for charging the launders directly or unloading into a 25-ft wide strip of space alongside the track allowed for iron storage.

This entire working area, including the track, is spanned by a five-ton bridge crane, having a span of 113 ft. The crane runway rails are supported by a series of steel A-frames at an elevation 31 ft above datum. The crane runway extends 630 ft, the over-all length of the plant, including feed and tail launders.

At the head end of the launder system, a 5 by 4-ft distributor extends across the launder heads. The flume carrying water from the mines empties into this, and vertical, adjustable head gates control the flow into individual launders.

At the tail end of the plant, the waters flow from the last drop box into a gathering launder, which conducts the water to a connecting flume, 360 ft long, where it is redistributed through regulating head boxes and passed into a concrete settling tank 20,000 sq ft in area. This tank has three parallel compartments, each 28⅓ ft wide and 235 ft long with an inclined bottom 10 ft deep at the inlet and four ft at the discharge end. An additional two feet are gained at the inlet end, in the form of a five-ft wide trench. This acts as a channel for the suction pump.

It is in these settlers that the almost colloidal precipitates that have escaped the final drop tank are trapped. Discharge from here is flumed a short distance to Silver Bow Creek.

When one of these final settlers is removed from operation, excess water is pumped into Silver Bow Creek by a portable slurry pump suspended from a crawl beam extending across the inlet end of all three compartments. The electrically operated pump is then lowered into the slurry, which is pumped to a filter plant alongside and east of the settlers.

This plant consists of a two-story building. On the ground floor are a vacuum pump, filtrate pump, and blower, as well as a railroad spur to accommodate one gondola. The upper floor supports an agitator tank, a continuous filter, and a cake conveyor. This scraper-conveyor discharges filter cake through a long slot in the floor at any selected point along the car, for uniform loading. The building also houses an office, a locker room, a garage, and a supply warehouse.

The crane mentioned above is a five-motor, 250 v d-c operated, single trolley bridge crane. It has a span of 113 ft and is equipped with a grab bucket and magnet hoists, each rated at five tons and mounted on a common trolley. This is a fast crane. The hoisting speeds are 100 ft per min, trolley travels at 200 ft per min, and bridge at 400 ft per min. The 250 v d-c used on magnet and motors is supplied by a motor-generator set, in a substation alongside the crane runway.

The one and three-quarter cu yd grab bucket and the 55-in. diam lifting magnet unload the railroad cars and charge the launders with iron. The grab bucket also loads cement copper from the drop tanks into tank cars for shipment to the smelter. The drop tank is first decanted by a portable pump, also handled by the crane.

The hydraulic slusher consists of a trussed bridge spanning all six of the launders mounted on wheeled trucks at 63½-ft centers which run on rails laid along the inside of the outside walkways. Electric power is collected from trolley wires along west runway A-frames. Mounted midway of the bridge is an electrically driven, 25 hp, centrifugal pump which picks up water through a footpiece reaching to the bottom of the center trough, and pumps it through a header along the bridge connected to individual headers, equipped with 16 nozzles, over each launder. The main header has valves for directing the water to any launder. The entire bridge is moved at 15 ft per min by a motorized speed reducer and chain drive, mounted at each end of the long bridge. The rig is provided with a reversing switch and movable trips to operate automatically over any section and any launder in the plant.

Two of these slushers are now in use. They agitate the scrap, and knock down the cement copper from the iron, and flush it along the launders to the drop tanks.

A short distance outside the mouth of the High Ore tunnel, the water passes through a 24-in. Parshall measuring flume, operating under free-flow condition. It is equipped with an upstream stilling well and a recording liquid-level indicator. This instrument makes a 24-hr chart of flow through the weir, readily scanned to learn the flow through every 24-hr period. This type of weir was chosen after trial of other types, over a period of years, had proven them unsatisfactory, and because of ease of removing "ocher," and because it is relatively unaffected by velocity of approach. It has been tested volumetrically and is quite accurate and reliable. It requires a minimum of attention and cleaning.

Just before entering the head distributing trough of the plant proper, the flume passes through a small house enclosing a dip sampler, which takes a multiple of four cuts through the stream at regulated intervals. Water discharging from the tail settlers is flumed through a duplicate sampler house, where another automatic dip sample is taken of the tails by the same type of electrical gear-motor-driven sampler as is employed on the heads.

Hydraulic slusher washes fine copper from cans which crane and magnet shift to adjacent launder

This plant was built to meet conditions encountered at Butte. Other plants in other parts of the country were studied and analyzed. The plant, as planned, was primarily intended to use shredded tin cans, but possible economic factors in favor of iron and steel scrap were easily envisioned. Adaptability to differing conditions and kinds of scrap was therefore of paramount importance. Other factors included the burden of primary "ocher" and the lack of free acid in the water itself. The plant, as built, therefore, resolved into a launder type plant constructed on a relatively heavy grade, with provision made for "ocher" extraction in the heads, and settlement and recovery of extremely fine copper in the tails.

The plant is so laid out that if, at some future time, the need arises, an

additional 300 ft of launders can be built along with three drop tanks at the same continuous grade in the space allowed between the plant and the tail settlers. The crane runway can be extended over this area, and also over the long tail settlers, if necessary.

The layout appears flexible enough to allow almost any foreseeable change or addition to the plant.

Plant Operations

At the portal of the High Ore drainage tunnel, a small settling pond catches the heavier sediments carried by the water before it passes through the Parshall weir. This pond is cleaned out by a power shovel about every three to four months. Once a week the approach well, leading to the weir, is thoroughly cleaned.

Each of the two "Rose Bowls" is drained and an average of 20 tons of dry material removed every two weeks. To clean a bowl, the water entering is cut off and passed through the other bowl. The water in the bowl being cleaned is drained off into the flume leading to the precipitation plant. When it becomes real yellow in color, it is by-passed as waste. After the water is gone, the amount of "ocher" is measured and samples taken to determine the amount of dry material in the bowl. The "ocher" deposit is easily washed out with a fire hose.

Automatic samplers, at the head and tail ends of the plant, cut a sample every ten min. and collect about two liters of water every 24 hr. These samples are assayed daily for an analysis of the heads and tails. These samplers can be set to run continuously or at any time interval desired.

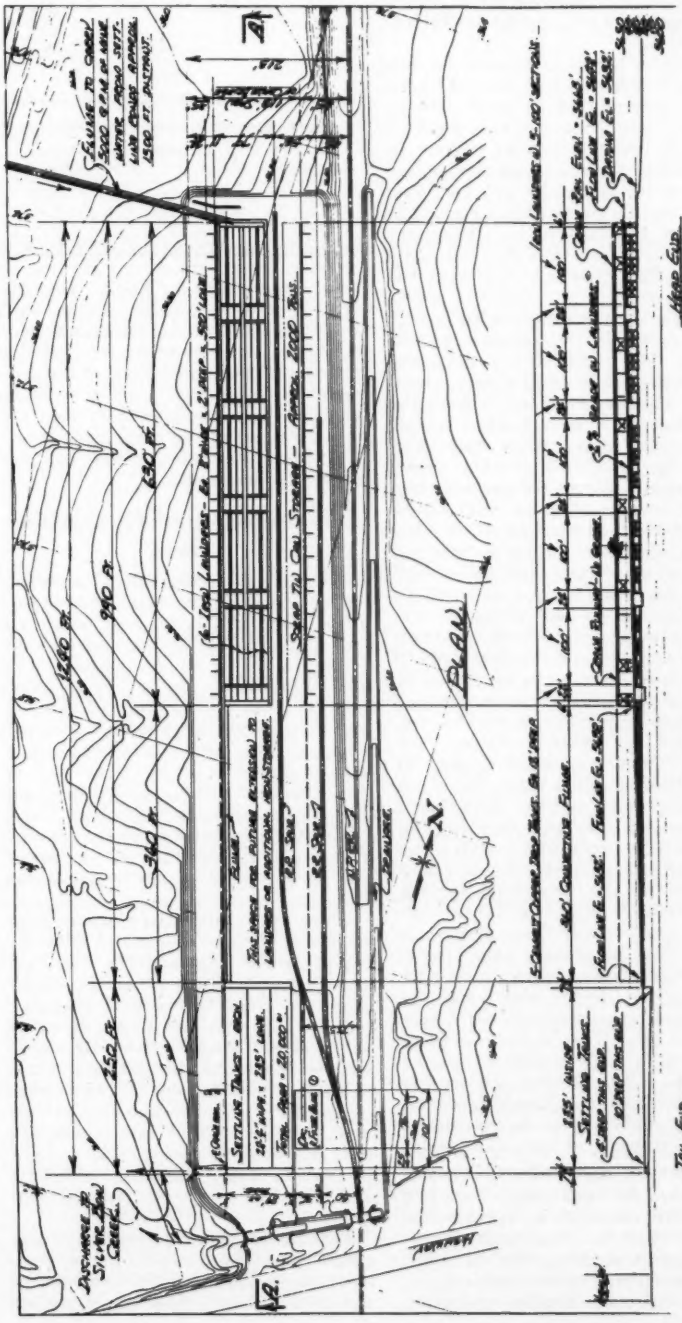
The flume discharges the water into the headers across the head end of the plant, and the distribution of water into the six parallel launders and slushing trough is controlled by gates from this header. Equal volumes of water are passed through each of the launders, and approximately 400 gpm are passed through the slushing trough when the hydraulic slusher is operating in Section 1. When the hydraulic slusher is operating below Section 1, the water is passed into the slushing trough from the connecting headers, across the head and the end of the drop tanks. The flow of water through the various launders is controlled by a series of dams, gates and connecting headers at the upper and lower ends of each of the drop tanks. By these means, any launder or drop tank can be cut out of service and cleaned.

Shredded tin cans are delivered to the plant in gondolas, while the miscellaneous scrap iron from the mines is delivered by truck. A car of tin cans will average 20 tons. The speed of unloading by the overhead crane depends on where the cans have to be placed. Tin cans unloaded direct from the car to the stock pile require one hour per car.

When cleaning out a launder, the water coming in is dammed off, and the overhead crane lifts the cans out of the launder, from the lower end first. A slushing machine is operated just ahead of the crane and magnet, so cans taken out of the launders are clean of copper. The cans moved are distributed into adjacent launders. The shredded tin cans in all cleaned launders are bedded about 18 in. deep.

The hydraulic slusher washes the copper precipitates into the drop tanks. Care is required not to wash the copper precipitates on through the drop tank, as the light material may carry across the tank and on into the plant or into the final settlers.

After a launder has been cleaned, shredded tin cans are placed to the desired depth, and water routed back through the launder. The general plan in cleaning is to start with Section 1 and clean out all the launders, starting with the west launder, then follow the same plan with Section 2.



Fore-sighted design allows for extension of launders

Sections 1 and 2 are cleaned out about every fourth day; Section 3, once a week; and Sections 4 and 5 every ten days.

In the operation of the hydraulic slusher, Sections 1, 2 and 3 are washed each day; Section 4, every other day; and Section 5, once per week. By following this plan, less light copper is carried into the lower settling ponds. To thoroughly wash and clean the tin cans, it is usually necessary to run the hydraulic slusher up and down the length of a launder four or five times. This depends to a large extent on the grade and "ocher" content of the copper water.

The drop tanks at the end of each section collect about 50 percent of the copper precipitated in that section; the remainder is carried past the drop tank and into the sections below. In Section 5, any precipitated copper carried past the last drop tank goes into the connecting flume and is carried to the large settling ponds. Any light precipitate copper that does not settle in these final ponds is lost with the tailings.

When a drop tank fills with cement copper to within four or five ft from the top, the ends of the tank are dammed off, and a small electric pump is used to remove the water from the top. Then the overhead crane churns the cement copper with the grab bucket for 15-20 min. This action forces more water to the surface. Allowed to stand for one or more hours, this water is then pumped off and discharged into an adjacent launder. The grab bucket then loads the cement copper into tank cars. It requires about one hour to load 45 tons.

In cleaning the lower settling ponds, the top and bottom are dammed off and the pond allowed to settle for 24 hr. An electric slurry pump, rated at 400 gpm and hung from a crawl beam, discharges the water to Silver Bow Creek. When the water begins to show a marked yellow color, the pump is throttled down and the light slurry is discharged into the two settling ponds still in operation. After the light slurry is pumped off, the pump is lowered into the sump of the settling pond. This remaining slurry of "ocher" and copper precipitates is pumped into the storage tank in the filter house, from which it is run through a continuous filter, and the cake moved by conveyor to slots over a railroad car. It requires three man-shifts to fill a gondola with 40 tons of filter cake. The thicker the slurry, the better the cake delivered from the filter. A half-in. cake is maximum, with an average of three-eighth-in.

The plant is operated continuously on a three-shift basis, seven days per week. Men required to operate the plant per shift are: one crane operator, one man, swamper for the overhead crane on iron and cement copper, and one hydraulic slusher operator; total three men per shift. In addition, it requires two men on day shift to operate the filter, drain and clean the "Rose Bowls" and the final settling ponds, and assist in emptying the drop tanks when cement copper is being loaded. This amounts to 11 men per day. One operating boss and a superintendent comprise the salaried personnel of the plant.

Following is the average monthly analysis of heads and tails:

Month	Water gpm	Ph.	Heads gm/l	Tails gm/l	Percent recovery	Pounds Cu extraction
May	5,010	3.20	0.311	0.019	93.89	544,000
June	5,162	3.34	0.334	0.020	94.01	583,500
July	5,175	3.40	0.286	0.021	92.5	510,000

Copper Precipitation by Each Section

		Gm/l Cu	% Precipitation	Gm/l Fe	% Total Fe increase
Heads		.263		.49	
End Section	1	.120	54.27	.69	45.4
	2	.047	27.82	.84	34.1
	3	.023	9.33	.88	9.1
	4	.017	2.11	.92	9.1
	5	.012	1.90	.93	2.3
			95.43		100.0

Water Temperature (Fahrenheit)

Atmosphere	High Ore Portal	Heads
48°	82°	79°
39°	83°	78°
51°	85°	81°

Comments and Operating Data

The automatic mechanical samplers in service at this plant are considered to be very reliable for both head and tail sampling. These samplers have been checked by hand sampling at 15 min. intervals. The average feed sample from the mechanical sampler ran three percent higher than the hand sample. The tailing sampler checked almost perfectly.

A check of the Parshall weir readings by emptying a "Rose Bowl" and filling under careful control indicates that the Parshall readings are about one percent high, which is considered good.

Since the start of the plant on September 8, 1949, to August 1, 1950, the "Rose Bowls" removed 660 dry tons of "ocher," handling all of the water from the High Ore central pumping plant. This amounts to 20 dry tons per week of "ocher" that would otherwise be handled in the plant itself and shipped to the smelter at Anaconda.

Various types of iron have been used. At the present time it appears that shredded tin cans should be used in Section 2 to Section 5, inclusive, and miscellaneous scrap iron in Section 1.

Turbulence with the resulting formation of ferric sulphate has been troublesome, both in the consumption of iron and the redissolving of cement copper, reflected in copper recovery. Several designs of headers for the head of the plant and the final settling ponds have been tried and proven unsatisfactory. The headers now in use have proven satisfactory. Turbulence has been cut down to a minimum. Although there is considerable aeration between the High Ore portal and the plant, there is no marked increase in the ferric iron content of the water. At the tailing and the precipitating plant the water oxidizes rather readily.

Following (Table I) is an analysis of the heads, all weights are in grams per liter:

Table I	Filtered	Unfiltered
Solids		7.56
Cu		0.29
Total Fe	0.44	0.57
Ferric Fe	0.43	
Al_2O_3	0.25	
CaO	0.35	
S	1.47	
Zn	0.32	

Electric, centrifugal, suction lift pumps were tried and found unsatisfactory. The present electric, vertical, slurry pump handles both the light and heavy slurry with little trouble.

Estimated moisture content and cake production per day from the continuous filter has not been realized. The slurry is very difficult to filter, but it is expected that with additional study this operation can be improved.

The percentage of total copper shipped from the different drop tanks and settlers from September 8, 1949, to August 1, 1950, is shown in Table II.

The percentage of total weight of iron placed in the different sections of the plant during the months of May, June and July, 1950, is shown in Table III.

The percentage of copper shipped from the different sections shows that the precipitated copper is carried on through the plant for a considerable distance, due to its fineness. Assuming that the percentage of the total weight of iron placed in the different sections is in direct proportion to the precipitated copper in that section,

Table II

Location	% Moisture	% Cu	% Total lb. of Cu shipped
Section 1	46.56	69.40	27.34
2	47.35	68.45	27.27
3	45.72	67.43	17.66
4	48.18	63.99	11.68
5	47.15	60.06	8.15
Total	46.91	67.04	92.10
Settling ponds	63.00	24.91	7.90

Table III

Location	Percentage of total weight of iron
Section 1	52.88
2	27.79
3	10.75
4	5.20
5	3.38

and that only one-half of the copper precipitated in Section 1 will settle in the drop tank in Section 1, the remaining one-half will be carried to the drop tank in Section 2 and one-half will settle there. The remaining one-quarter will be carried to the drop tank in Section 3, and one-half will settle there and so on through the final settlers and tailings. This assumption gives the final figures for settlement in the drop tanks of the different sections. See Table IV.

Table IV

Location of drop tank	Assumed percent basis of precipitation	Percent of total Cu settled	Calculated percent of total recovered Cu
Section 1	52.88	26.44	27.50
2	27.80	27.12	28.21
3	10.74	18.93	19.69
4	5.20	12.06	12.55
5	3.38	7.72	8.03
Total	100.00	92.27	95.98
Settler		3.86	4.02
Total		96.14	100.00
Tailings		3.86	
Total		100.00	

Table V

Location drop tanks	Calculated percentage of total recovered copper	Actual percentage of total copper shipped	Percentage of error, plus or minus
Section 1	27.50	27.34	+0.16
2	28.21	27.27	+0.94
3	19.69	17.66	+2.03
4	12.55	11.68	+0.87
5	8.03	8.15	—0.12
Total	95.98	92.10	+3.88
Settlers	4.02	7.90	—3.88
Total	100.00	100.00	

Comparing this percentage of calculated total copper recovered to the percentage of total copper shipped from the different drop tanks and settlers for September 1, 1949, to August 1, 1950, is shown in Table V.

This definitely shows that a portion of the precipitated copper in any section is carried beyond the final settling ponds, and that only about one-half of the copper precipitated in any given section is settled in that section's drop tank.

An investigation of the precipitates indicates that certain amounts of the shredded tin cans are carried into the drop tanks. Steps have been taken to prevent the cans from being carried into the drop tanks. The present consumption of iron per pound of copper is about two pounds. With water carrying .40 grams per liter, it is estimated that the iron consumption per pound of copper will be about 1.75 lb.

In general, the operations of the new plant have been satisfactory, with copper recovery now 92-94 percent.

FluoSolids Roasting

(*Continued from page* 34)

solubilities of 99 and 99.5 percent of the total copper are common.

When such solubilities are obtainable, the process of sulphating roasting and electrolytic deposition of copper from the sulphate solution becomes competitive with standard practice smelting in operating cost and offers large savings from the point of first cost, and therefore fixed charges.

There is one consideration that seems important at present. If the concentrate being roasted is too high in copper, so much copper sulphate is formed that the bed becomes sticky. It is much easier to roast a concentrate containing 26 percent Cu or less than one assaying 35—40 percent Cu.

The feed may be by means of a screw conveyor if the concentrate is dry enough to be crumbly; if wet and sticky, a slurry feed is best.

With about a 26 percent copper concentrate, capacities are about three (varying from two to five, depending on copper content) sq ft of reactor area per dry ton of feed per day.

The SO_2 gas obtained from sulphating roasting of copper concentrate is necessarily lower than in pyrite or zinc roasting; in the latter cases sulphates are kept at a minimum. When sulphating copper concentrate the SO_2 content of the gas will be five to six percent and SO_3 will be less than one percent with four to six percent O_2.

An important feature of the whole operation and the one where FluoSolids gives better results than obtainable with other forms of roasting is the small amount of iron that goes into solution. This is a function of temperature and atmosphere control. When these conditions are kept at their optimum, only about two percent of the iron present is taken into solution.

Typical results with a low copper concentrate, 13 percent Cu, are given under cupriferous pyrite. Results with a higher grade copper concentrate are given above (Table VI).

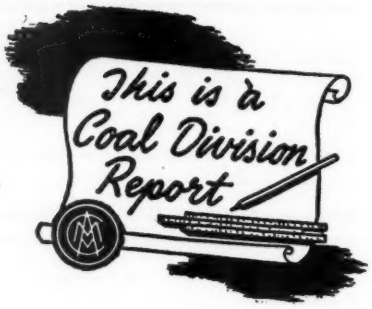
About 60 percent of the calcine reports as overflow product, and the rest is carryover. In this case the carryover solids can be trapped out of the gas in cyclones and the tail gas from the cyclones is scrubbed instead of going to a Cottrell.

TABLE VI

	% Cu	% Fe	% Total Sulphur	% Sulphide Sulphur
Concentrate to be roasted	26.7	28.0	36.2	35.8
Calcine	22.8	22.9	9.9	0.0
Water leach tailing	1.1	56.7		
5% H_2SO_4 leach tailing	.5	58.6		
Percent of total water soluble	97.7	2.0		
Percent of total *acid soluble	99.0	2.6		

*5% H_2SO_4

Sludge Recovery in Anthracite Fields



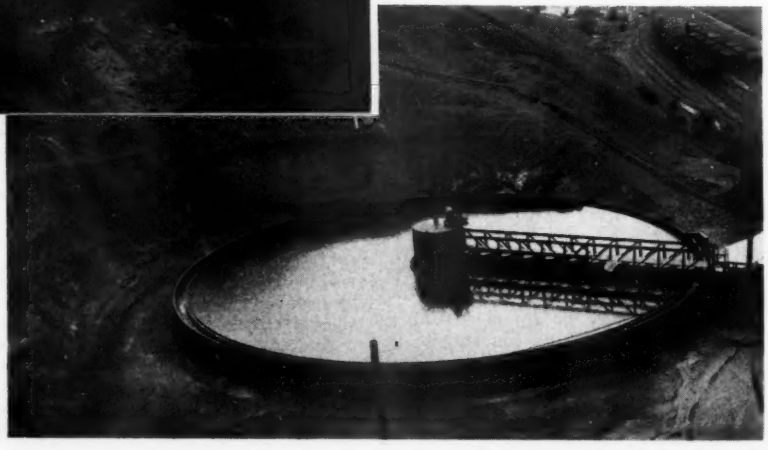
Report of the Surface Preparation Committee Showing Methods That Have Been Effective in Eliminating Stream Pollution and Have Also Reclaimed a Marketable Product

By W. B. PETZOLD
and
E. T. POWELL

SLUDGE recovery has two objectives preventing stream pollution and reclaiming a former waste product that has a definite fuel value. The first of these objectives, through various State regulations, is becoming a "must" and the second is developing as a refinement of mechanical coal preparation technique by lowering the size limits of cleaned coal recovery. By these methods a number of mining companies have been able to reclaim a product whose value, in dollars and cents, will offset the cost of keeping the waste material out of streams and, in a number of cases, will result in an over-all profit.

The foregoing applies to the entire coal industry but in the Anthracite Field sludge recovery has been accelerated through the passage of Pennsylvania Pamphlet Law 1987, dated June 2, 1937, and amended by Act No. 177, May 8, 1945. This is entitled "An Act to Preserve the Purity of the Waters of the Commonwealth for Protection of Public Health and for Industrial Consumption and Recreation." The rigid enforcement following the passage of this Act has made it necessary for practically all of the coal companies to recover sludge from the cleaning plants and by January 1, 1951, it was said the program in the Anthracite Field was approximately 99 percent complete.

The report presented here will not attempt to discuss the merits of various methods of fine coal cleaning employed by mining companies, but rather will describe four typical methods used to recover sludge and otherwise prevent such material from entering the streams. In addition to the clarifier tanks, other operations depend entirely on the settling method to make a satisfactory effluent. A few operations dispose of the breaker wash water by flushing it into the mines. However, most of the companies in the anthracite region use a combination of the methods described here and in addition some companies have installed the Dutch Cyclones.



Refuse settling basin (above) receives the waste overflow pumped from the clarifier tank (right)

Powderly Operation

All of the wash water from Powderly Breaker is flumed to a 120-ft diam. clarifier tank. The overflow from this tank is returned to the breaker for reuse and the underflow is pumped to a Humphreys Spiral Plant where the fine coal is recovered.

The clarifier underflow of 1900 gpm and containing 1.2 tons of solids is passed over a 3/16-in. vibrating screen to remove the oversize which is returned to the breaker. The underflow goes to a feed tank and is pumped to the spirals which produce 0.6 ton of cleaned silt per minute or 252 tons per 7-hour shift. After dewatering, the silt is transported by conveyor belt

to railroad cars. The refuse is collected in a refuse tank and pumped to a settling basin for final disposal.

The cleaned material is used at a company-operated power plant and ranges from 16 to 20 percent ash, which is higher than acceptable to the market. However, this material is satisfactory for the power plant and its use for that purpose has enabled the company to divert the better-grade material to the market.

During the day shift, feed for the spiral plant comes from the clarifier as described above, but in times of short supply some material is added from an old breaker silt bank to make up the deficit. During the second shift all feed comes from this old bank. The plant is constructed for warm weather operation only and during the winter months the breaker refuse silt is stored on the old breaker silt bank for recovery during the summer. No sludge enters the streams.

Pine Ridge Operation

The purpose of this operation is to prevent stream pollution. As shown on the attached flow sheet, the installation is comparatively simple; waste water from the breaker passes into a 120-ft diam. clarifier; from this, the overflow goes directly to a surface stream and the underflow to a settling basin. The breaker waste water is at the rate of 4800 gpm; of this, 3920 gpm is overflow and the remaining 880 gpm is the underflow containing 8.33 percent solids which amounts to 18.3 tons per hour. The analyses of the various flows are given in Tables 1 and 2.

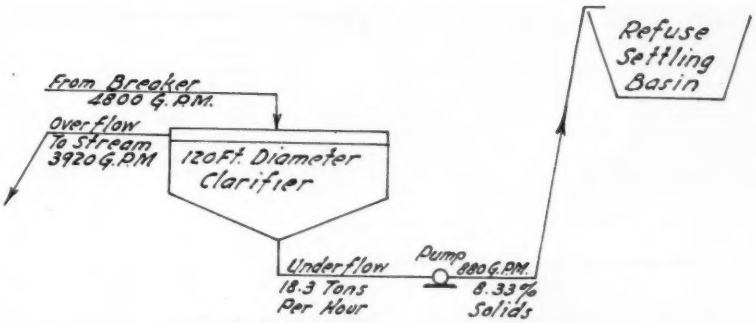
TABLE 1—PINE RIDGE

	Feed to Clarifier			
Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/64	0.2	0.2	18.8	18.8
+28	2.6	2.8	13.8	14.2
+35	4.8	7.6	13.0	13.4
+48	8.6	16.2	12.8	13.1
+60	9.4	25.6	15.6	14.0
+80	9.4	35.0	18.0	15.1
+100	8.2	43.2	25.6	17.1
+200	17.8	61.0	28.0	20.3
—200	39.0	100	48.0	31.1

TABLE 2—PINE RIDGE

	Underflow to Settling Basin			
Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/64	...	...	...	...
+28	2.5	2.5	18.0	18.0
+35	2.0	4.5	16.2	19.2
+48	4.0	8.5	17.0	17.1
+60	7.5	16.0	16.8	17.0
+80	9.5	25.5	19.0	17.7
+100	9.0	34.5	25.0	19.6
+200	28.5	63.0	30.8	24.7
—200	37.0	100	50.0	34.0

Overflow to Stream: No analysis has been made but effluent is acceptable to State.

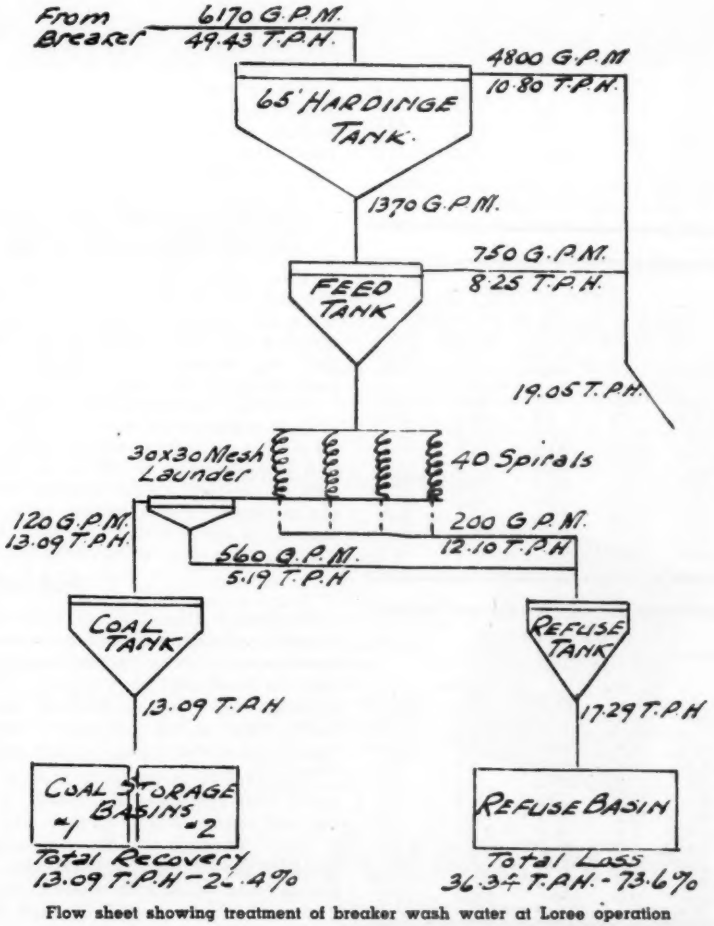


Flow sheet—Breaker wash water at Pine Ridge

Loree Operation

This operation, treating waste water from an anthracite breaker, has a double purpose: (1) to reclaim a merchantable silt and (2) to prevent stream pollution. The intake to the system is 6170 gpm of breaker wash water carrying 49.43 tons of silt per hour, from which 13.09 tons per hour of prepared silt are recovered. This ranges in size from 3/16 in. to 0.

As shown on the attached flow sheet, the process is in two major stages. The water from the breaker first passes into a 65-ft Hardinge tank; its overflow of 4800 gpm is wasted and the underflow of 1370 gpm goes to a feed tank which further reduces the volume to 620 gpm with 30.38 tph of solids and supplies a bank of 40 Humphreys Spirals. Each spiral handles approximately ¾ ton per hour and at this point in the process 260 gpm of water is added to the flow. The recovered product from the spirals goes to a 30 x 30 mesh launder that



Flow sheet showing treatment of breaker wash water at Loree operation

makes the final reclamation of 13.09 tons per hour of merchantable silt.

This material has had ash as low as 9.9 percent; however, it usually runs from 10½ to 12 percent ash and is sold to outside customers. The refuse from the spirals ranges from 48 to 50 percent ash. The size consist and analyses at the various points in the system are given in Tables 3 to 7.

TABLE 3—LOREE

Breaker Wash Water to Clarifier

Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/32	0.2	0.2	20.8	20.8
+1/16	0.4	0.6	24.5	23.3
+3/64	1.2	1.8	20.7	21.6
+28	3.8	5.6	22.4	22.1
+35	6.6	12.2	24.3	23.3
+48	8.2	20.4	25.9	24.3
+60	7.8	28.2	30.4	26.0
+80	5.0	33.2	30.3	26.7
+100	5.2	38.4	36.3	28.0
+200	13.4	51.8	47.0	32.9
—200	48.2	100	67.3	49.4

TABLE 4—LOREE

Feed Tank Overflow 4.0% Solids

Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+48	...	...	...	...
+60	0.7	0.7	7.1	7.1
+80	5.6	6.3	14.5	13.7
+100	8.3	14.6	14.9	14.4
+200	25.7	40.3	20.5	18.3
—200	59.7	100	53.3	39.2

Classifier Overflow: Contains 1.1% Solids which average 64.4% ash.

TABLE 5—LOREE

Feed to Spirals 21.4% Solids

Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/32	0.6	0.6	29.3	29.3
+3/64	7.9	8.5	20.9	21.5
+28	11.7	20.2	25.1	23.6
+35	14.0	34.2	24.6	24.0
+48	16.6	50.8	27.2	25.0
+60	8.1	58.9	29.5	25.7
+80	11.9	70.8	34.0	27.1
+100	7.0	77.8	40.0	28.2
+200	11.7	89.5	46.1	30.6
—200	10.5	100	59.2	33.6

TABLE 6—LOREE

Prepared Silt

Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/32	1.0	1.0	24.8	24.8
+3/64	20.9	21.9	8.8	9.5
+28	17.3	39.2	8.4	9.0
+35	19.9	59.1	9.4	9.2
+48	19.3	78.4	9.7	9.3
+60	7.5	85.9	11.0	9.4
+80	7.2	93.1	14.3	9.8
+100	2.3	95.4	20.6	10.1
+200	2.6	98.0	32.7	10.7
—200	2.0	100	54.1	11.5

TABLE 7—LOREE

Refuse 14.9% Solids

Mesh	% Wt. By Size	% Wt. Cum.	% Ash By Size	% Ash Cum.
+3/32	...	...	...	...
+3/64	2.9	2.9	61.7	61.7
+28	10.6	13.5	55.0	56.4
+35	12.2	25.7	45.8	51.4
+48	16.4	42.1	48.7	50.3
+60	8.4	50.5	47.1	49.8
+80	14.1	64.6	48.5	49.5
+100	9.0	73.6	49.2	49.5
+200	14.8	88.4	54.7	50.4
—200	11.6	100	63.5	51.9

Susquehanna Froth Flotation

A silt recovery plant was installed early in 1947 at the No. 7 plant of Susquehanna Collieries to recover fines that had a commercial value and to clarify the breaker waste water by means of a settling tank and pond. Of the reclaimed coal, amounting to 700-750 tons per shift, the +28 mesh material is untreated and is consumed at the colliery boiler house; the finer coal is treated at the flotation plant and shipped to a public utility company power plant, where it is pulverized and used for boiler fuel.

The waste water from the breaker is discharged at a rate of approximately 3000 gpm and in 7 hours carries about 850 tons of solids. The solids range in size from +¾64 to 0 and being washer reject has, of course, a high percentage of ash. The reclamation process recovers the +200 mesh material and reduces its ash content to approximately 14 percent.

The waste water coming from the breaker is first passed over a launder screen which takes out the +28 mesh material and water; this goes to a settling tank where the water is drained off and the solid, which has a low ash content, is sent direct to the stockpile for the power plant. This first step recovers approximately 530 tons of coal in a 7-hour shift.

The through-product from the screens contains 320 tons per shift of 28 mesh and smaller solids, passes to a hydroseparator 50 ft in diameter and 10 ft deep. The overflow from the separator which carries most of the —200 mesh material goes to the waste disposal pond, where the water is clarified by settling. The product recovered from the bottom of the cone, amounting to about 350 gpm, carries approximately 40 percent solids of +200 mesh size. This goes to an agitator where it is first mixed with fuel oil and then with pine oil. The resulting pulp has water added to bring the solid content to about 20 percent and this goes to a battery of 10 airflow flotation cells for cleaning and, when necessary for better separation, to a second battery of 8 cells.

The tailings pass to the waste disposal pond and the clean coal, amounting to about 100-150 tons per shift, is delivered to two settling basins. Each basin will hold about one month's production. After settling, the water is siphoned out and the coal loaded for shipment to the boiler plant. This coal contains approximately 13 percent surface moisture so it is further dried at the power plant and pulverized for boiler fuel.

TABLE 8—SUSQUEHANNA
Ash Content of Breaker Feed

Plus 3/64	17% ash
3/64 x 28 m	14% ash
28 x 200 m	39% ash
Minus 200 m	50%

TABLE 9—SUSQUEHANNA
Size Consist of Flotation Plant Product

+3/64 in.	5.36%
+28 m	10.15%
+200 m	78.11%
—200 m	6.38%

Tables 8 and 9 show the ash content of the breaker waste which is the recovery plant feed and the size consist of the final product. The ash in the final product will be about 13.91 percent. To recover 100-150 tons per day the flotation plant is operated one shift of 7 hours by two men. A third man runs the truck loader. The power cost on the basis of cleaned coal output of 30 tons per hour will be approximately 10¢ per ton. This applies to the flotation product only and does not consider the 530 tons of coal that is recovered directly from the breaker waste over the high-speed screens.

Plan to Pipe Mined Coal

Pittsburgh Consolidation Coal Co. recently announced plans for a demonstration-size pipeline system in eastern Ohio to move coal as a slurry. The pipeline will be constructed near Cadiz, Ohio, at the Georgetown strip operations of the Hanna coal division.

This project is an outgrowth of a small pilot operation at Liberty, Pa., and will consist of a 12-in. pipe, 17,000 ft long. Through this the coal, after being mined, washed and crushed to fine size and mixed with water to form a slurry, will be moved through the line under pressure by pumps designed specifically for that purpose. At the discharge end of the line, coal drying equipment will be situated to dewater the slurry and prepare the coal for actual use.

It was also announced a bill will be introduced into the Ohio Legislature to permit common carriers to transport coal by this method.

Company officials said the pipeline will be completely instrumented to permit the recording of all pertinent engineering data. Construction will start as soon as weather permits.

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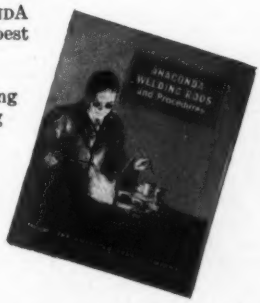

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Wheels of GOVERNMENT

AMC

As Viewed by A. W. DICKINSON of the American Mining Congress

ASIDE from the airing of RFC loans, gambling monopolies and election campaigns, the Washington spotlight has currently centered on the controversies over foreign policies and the demands of the armed services for manpower. The proposed Revenue Bill, the renegotiation measure and the three-year extension of the Foreign Trade Agreements Authority, together with Administration pressure for approval of the St. Lawrence Waterway and Power Project, have been consuming practically all of the time of Senate and House committees having jurisdiction over these measures.

On the revenue-raising front the issue between the White House and Congress over the proposed "two-package" tax program was met by the decision of the House Committee on Ways and Means to review the whole revenue situation at length—thus precluding passage of a "quickie" bill. In taking this position the House committee undoubtedly has the full support of the clear-thinking Senate Committee on Finance.

Taxation

The President's tax message of February 2 called for immediate enactment of a $10 billion revenue bill to be followed later in the year by a measure to yield a further $6.5 billion. The $10 billion was to be raised by a $4 billion yield from increased personal income taxes, with $3 billion from corporate rate increases and $3 billion from excise taxes. The message repeated previous attacks on depletion allowances by calling attention to "the gross under-taxation of the oil and mining industries."

On February 5 Treasury Secretary Snyder, testifying before the Ways and Means Committee, implemented the message with a call for an increase of 8 percentage points in the corporate normal tax, 4 percentage points on individual income taxes, an upward adjustment of the taxes on capital gains and a wide range of increases on excise taxes. Snyder advocated reduction of the depletion rate for oil, gas and sulphur to 15 percent and for nonmetallic minerals to 5 percent of the gross income from the property.

He did not mention the depletion rate for metals or for coal, but in his testimony of a year ago he stated, "The existing 15 percent rate for depletion allowed to the metals would be left unchanged."

Twenty-one witnesses from the mining industry presented testimony before the Ways and Means Committee on March 5. Leading in the justification of the percentage depletion allowance, Donald A. Callahan, vice-president, American Mining Congress, reviewed the history of the law and explained that the present rates are based on exhaustive studies made by the Congressional Joint Committee on Internal Revenue Taxation. Taking issue with Snyder's reference to "capital" as "money invested," Callahan declared it to be an utterly erroneous assumption in the case of mines. He emphasized that the "capital" of a miner is the mineral and metal contained within the boundaries of his property and that his "investment" in addition to the money actually used in the discovery, exploration and development of his ore body is something vastly different and cannot be measured in dollars and cents.

Continuing, Callahan declared, "The time consumed, the hardships endured, the losses in unsuccessful ventures, the disappointments and physical and mental trials of anyone who brings a commercial ore body into production are immeasurable. There is only one way of determining the miners' capital and that is the value of the ore body which he has forced nature to reveal to him." He called upon Congress to recognize that one of the greatest incentives that can be extended to increase the production of needed minerals and metals would be an increase in the depletion allowance due to the additional costs and hazards that have come about since the passage of the original amendment to the law in 1932.

American Mining Congress Tax Committee Chairman Henry B. Fernald explained that the major problem today is that of production to meet defense and civilian needs, to prevent or limit inflation and to provide the money to meet Federal budget expenditures. He insisted that the only way this production can be had is by allowing adequate incentive to private individuals to search for, develop and produce needed minerals. He urged the importance of (1) adequate allowances for depletion; (2) recognition of expenses incurred in prospecting, exploration and development as operating expenses, either in the year incurred or, at the taxpayer's election, deferred and written off against resulting ore; (3) clarification of the present provision for special amortization, so as to leave no question that 100 percent of the emergency facility may be amortized; and (4) amendment of Section 122, the net operating loss provision, so as not to deny percentage depletion deduction in the year of loss or any year to which the net operating loss deduction is carried. Fernald also urged limitation of Government expenditures; limitation of the corporate tax rate to a maximum of 50 percent for normal and surtax; and retention of the capital gains rate at 25 percent.

Supporting witnesses in the mining industry's presentations included M. D. Harbaugh, vice-president, Lake Su-

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Washington Highlights

CONGRESS: Moving cautiously on legislation.

TAX: "Two-package" program rebuffed.

RENEGOTIATION: Minerals exemption safe.

TRADE AGREEMENTS: "Peril Point" protection included.

EXPLORATION AND DEVELOPMENT: $10 billion aid provided.

DMA: Advisory Committees confer.

COAL: Munitions Board directs use.

★ ★ ★ ★ ★ ★ ★

perior Iron Ore Association; Langbourne M. Williams, president, Freeport Sulphur Co.; Fred O. Davis, vice-president, Potash Company of America; James W. Haley, National Coal Association; Kenneth B. Ray, Food Machinery & Chemical Corp.; S. W. Tuttle, International Talc Co.; Charles W. Nielson, Edgar Bros.; John H. Bishop, Universal Zonolite Co.; Horace M. Albright, chairman, National Minerals Advisory Council; Ralph L. Dickey, president, Kelley Island Lime & Transportation Co.; and Philip L. Corson, producer of metallurgical limestone.

Hearings are expected to run into the latter part of March and a bill may be reported by mid-April.

Renegotiation

The Senate-House conferees' agreement on the Renegotiation Act of 1951, H. R. 1724, has been approved by both Houses and now only requires the President's signature to become law. Strong representations made by the mining industry finally resulted in the inclusion of the mineral raw materials exemption of the World War II Act, which was restored by the Senate Finance Committee. This is important to mining as it provides a mandatory exemption for "any contract or subcontract for the product of a mine, oil or gas well, or other mineral or natural deposit, or timber, which has not been processed, refined, or treated beyond the first form or state suitable for industrial use."

This is the language under which regulations have been written and administered in the renegotiation of contracts and subcontracts since 1943. Metals, or other mineral products at a corresponding industrial state, will thus not be made subject to renegotiation. As originally introduced by Chairman Doughton of the House Ways and Means Committee, no exemption was provided for the mineral raw materials.

Of special interest to mining machinery manufacturers and suppliers of equipment is that this exemption also makes their sales to mines and mining plants non-renegotiable.

By its action on this raw materials exemption the Congress has removed a serious deterrent to the work of the Defense Minerals Administration in increasing development and production of metals and minerals for the civilian economy and the national defense.

Trade Agreements

The Foreign Trade Agreements Extension Bill is now under consideration in the Senate Committee on Finance following the close of hearings March 9. As received from the House, the bill extended the President's authority to negotiate trade agreements for three years from June 12, 1951, with certain amendments which are of particular interest.

These amendments would (1) hold up Presidential action on trade agreement revision until the U. S. Tariff Commission has determined, item by item, the point below which tariff duties could not be cut without "peril" to affected industries, and require the President to notify Congress within thirty days as to any tariffs on which reductions are being made below the "peril points," and the reasons in each case; (2) prohibit future tariff concessions as to the goods of any country "dominated or controlled by the foreign Government or foreign organization controlling the world Communist movement"; (3) permit the President to suspend any concessions under the Act if necessary to "prevent or remedy" injuries to domestic industry caused by the concessions (this amendment also requires the U. S. Tariff Commission to investigate claims of injury to U. S. industry arising from imports and recommend to the President the action he should take by way of remedy); and (4) provide that concessions on foreign farm commodities shall not apply unless the foreign product is to be sold above the domestic support price.

Representatives of the mining industry stressed the need of a further amendment in the bill to offset the adverse effect of foreign currency devaluations. Felix E. Wormser, secretary of the Emergency Lead Committee and vice-president of St. Joseph Lead Co., told the members of the Senate Finance Committee that in the Trade Agreements Conference now going on at Torquay, England, no consideration is being given to the effect of currency devaluation in the adjustment of the American tariff rates. He recommended an amendment to the pending bill which would require the President to include in any international trade conference, consideration and allowance for the effect of foreign currency devaluation on American commerce. He declared that failure to consider this factor in an international trade conference would omit one of the most devastating trade weapons of all from the scope of trade agreement conferences.

Secretary Julian D. Conover of the American Mining Congress urged the Finance Committee to retain the House provision under which the Tariff Commission would again be charged, prior to the negotiation of any trade agreement, with the establishing of "peril points." He also recommended retention of the new "escape clause" rules, calling for investigation by the Tariff Commission of applications for relief—together with remedial measures, including the establishment of import quotas—in cases where trade agreement concessions cause or threaten serious injury to domestic industries. Mr. Conover cited the bituminous coal industry as a specific case in point at the present time due to excessive importations of residual fuel oil. He also called for a further amendment to require adjustments in tariffs to compensate for the discriminatory advantage accruing to foreign commerce and industry through the devaluation of foreign currencies.

Exploration and Development

Implementing the Defense Production Act, the Defense Minerals Administration late in February pushed ahead on a program allocating $10 million to promote exploration for strategic and critical metals and minerals. This will include manganese, chrome, cobalt, nickel, tungsten, molybdenum, fluorspar, miscellaneous ferro-alloy ores, beryl, cerium, and rare earth ores, columbium, lithium, platinum, tantalum, antimony, bismuth, copper, lead, mercury, zinc, cadmium, asbestos, cryolite, sulphur, kyanite, mica, monazite, and such others as may be certified by the Secretary of the Interior to DPA from time to time.

The Secretary will receive applications for assistance, by means of grants, in exploration projects and thereafter enter into exploration contracts on a project-by-project basis on the general principle that funds contributed by the Government will be matched by private capital. Funds provided by such capital will in general be expended prior to or concurrently with the expenditure of funds provided by the Government. In emergency the Secretary can depart from the matching principle. All contracts provide for repayment to the Government on a royalty basis from net mill, smelter or other proceeds from the project. Advances of Government funds will be made periodically, with applicants required to submit reports of expenditures and progress not later than fifteen days after the close of each month. Government funds may be used only for direct costs and operating overhead of the approved project and may not be applied to administrative expenses not directly related to the project.

Commenting on the program, Senator Pat McCarran of Nevada stated that if it operates as Congress intended in passing the Defense Production Act, the small miner and prospector who does the exploratory work would get a break from the Government. McCarran said he was not too pleased with the proposal that the funds be expended on a matching basis, but would hold off criticism until he has an opportunity to study the schedule of rates and application forms for Government participation.

Meanwhile Senator Murray of Montana and Representative Baring of

(*Continued on page 74*)

Specifications for Roof Bolting Materials

A Report of the Committee on Roof Action Submitting Tentative Recommendations for Sizes and Designs of Roof Bolts and Accessories

Your Comment Is Invited

The Committee wishes to emphasize that the specifications given here are tentative and are presented for consideration. Some standardization along these lines will be welcomed by operators and manufacturers, but an accepted standard must represent the consensus of those who will use it. So before proceeding further, we want your opinion—addressed to: Committee on Roof Action, American Mining Congress, Ring Building, Washington 6, D. C.

ROOF BOLTING has been one of the most phenomenal developments of modern coal mining. In less than three years it has grown from a few experimental installations to an accepted practice, successfully applied throughout the coal fields in many different seams and diverse classes of roof strata.

As can be well understood, numerous trials and experiments were necessary to learn the correct technique for bolting and to determine how it could be made an affective and economical method of roof support. Out of these trials, two types of anchors have evolved—the expansion sleeve and the slotted wedge, but there has been a wide range in sizes and designs used for the rods, nuts, plates and other materials. This is simply the natural result expected when a number of experiments are carried on more or less simultaneously by different companies and in different localities.

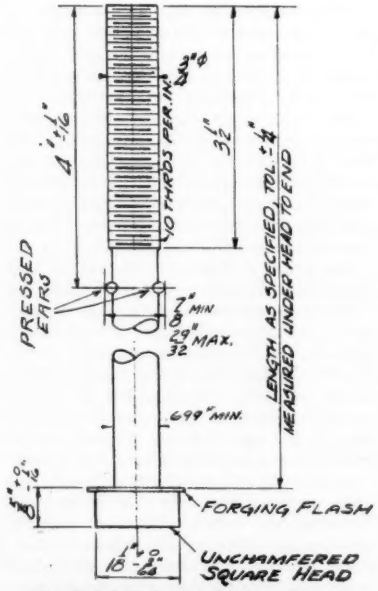
Today, with the growing demand for roof bolting, the existing diversity in dimensions and specifications is causing considerable inconvenience and is raising costs, both to the operator and the manufacturer. So it seems the time has come for corrective measures and that the industry should take advantage of its background of experience to bring about some degree of uniformity in materials and methods.

With the foregoing in mind the Committee undertook a study to see whether practical standards could be developed, and the following tentative specifications were prepared as a result of this study. The recommendations are based on the majority opinion of the committee, and it is believed that the specifications given here will be suitable for 90 percent of mine roof bolt installations.

Headed Type Roof Bolts

For Use with Expansion Sleeve

Bolts are to be ¾ in. diam. with rolled thread 3½ in. long at one end. Other end is to have special unchamfered square bolt head, 1⅛ in. across flats and ⅝ in. over-all thickness with forged flash left on the head. Two pressed ears 29/32 in. max. over-all diam. for supporting expansion sleeve are to be centered 4 in. from threaded end of bolt. Steel Specifications: New billet steel of phosphorus .04 percent max. and sulphur .05 percent max. having a minimum tensile strength of 60,000 psi with a minimum elongation of 20 percent in 2 in.



Headed bolt for expansion sleeve.

Reasons for the Recommendations:

A bolt larger than ¾ in. diam. would require too large a drilled hole. A smaller bolt would not have sufficient strength nor would it develop sufficient torque for anchoring the expansion sleeve.

A rolled-thread bolt is stronger than a cut-thread bolt and costs less to manufacture.

A special bolt head of the size recommended is as strong as the bolt itself and costs less to manufacture than a heavy head.

Elimination of the chamfer provides greater wrenching surfaces and increases wrench life.

A square head provides greater bearing surface, greater wrenching surface, increases wrench life, and costs less to manufacture.

The flash if left on provides a washer-like contact with the roof plate, giving greater bearing.

The thread length of 3½ in. is sufficient for most expansion sleeves.

Two pressed ears provide the most economical method of supporting the expansion sleeve while anchoring.

Steel specifications are as recommended by the group attending the U. S. Bureau of Mines meeting in Washington, D. C., May 22, 1950.

Expansion Sleeves

Material for cast expansion sleeves shall conform to the requirements of ASTM Specification for Malleable Iron Castings A-47-48, Grade 32510.

Tapered plugs used with expansion sleeves may be of the same material as sleeves, or steel with maximum sulphur content of 0.23 percent.

Slotted Type Roof Bolts

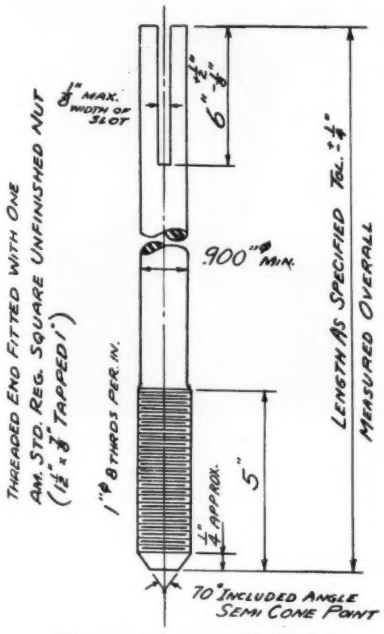
For Use with Wedge

Rods are to have 1 in. diam. rolled thread 5 in. at one end complete with regular square nuts; the other end is to have a slot 6 in. long.

Steel Specification: New billet steel conforming to ASTM Specification No. 131-49T for Structural Steel.

Reasons for the Recommendations:

A bolt larger than 1 in. diam. would be unnecessary for most installations. A smaller bolt would be weakened too much by conventional methods of slotting.



Slotted bolt for use with wedge.

A rolled-thread bolt is stronger than a cut-thread bolt and costs less to manufacture.

A 5 in. length of thread is believed to be sufficient for careful installation. A greater length would tend to increase the protrusion of the bolt below the surface of the roof.

A slot length of 6 in. is common practice and there seems no good reason for changing.

A regular square nut, referring to width and thickness, is as strong as the bolt itself. It costs less than a heavy nut.

A square nut provides greater bearing surface, greater wrenching surface, increased wrench life and costs less to manufacture. (A regular square nut has 26 percent more bearing surface than a regular hex nut.)

Steel specifications are as recommended by the group attending the U. S. Bureau of Mines meeting in Washington, D. C., May 22, 1950.

Wedges for Slotted Bolts

Length: 5½ in.
Width: ¾ in.
Thickness: ¾ in. or
⅞ in. or
1 in.
Tapered
to
1/16 in.

Reasons:

A wedge width of ¾ in. and a length of 5½ in. are commonly used and there appears no reason to change.

The recommended wedge thickness of ¾ in., ⅞ in. or 1 in. is optional with the operator depending on the comparative softness of the stratum in which the bolt is anchored. The point of the wedge should be tapered to 1/16 in. or under.

Roof Ties

No. 5 Section (5 lb. per ft) or No. 6 Section (6 lb. per ft) optional. Lengths as desired in two-foot graduations; viz., 10, 12, or 14 ft. Ties are to have four punched holes; normally spaced one foot from each end with intermediate holes at equal intervals.

Roof Plates

Thickness: ⅜ in.
Sizes: 6 in. by 6 in.
8 in. by 8 in.
Hole: ⅞ in. for ¾ in. bolt
1⅛ in. for 1 in. bolt

Reasons:

A plate thickness of ⅜ in. is giving satisfactory results; thinner plates tend to cup easily. The sizes given are now specified for over 80 percent of the roof bolt installations.

Holes centrally punched in roof plates are normally ⅛ in. larger than the nominal diameter of the roof bolts. The dimensions given are satisfactory and should be acceptable to all users.

Roof Channels

C-4 Channel weighing 5.4 or 7.25 lb. per ft optional. Lengths as desired in two-foot graduations; viz., 10, 12, or 14 ft. Channel is to have four 1½ by 2½ in. oval holes; normally spaced one foot from each end and with intermediate holes at equal intervals.

Angle Washers

For 45-Degree Angle:

Size: 3 by 3 by ⅜ in.
Length: 3 in. for roof plates
3 in. for roof channels
4¼ in. for roof ties.
Holes: ⅛ in. larger than bolt.

For 60-Degree Angle:

Size: 3½ by 2½ by ⅜ in.
Length: 3 in. for roof plates
3 in. for roof channels
4¼ in. for roof ties.
Holes: ⅛ in. larger than bolt.

Plate Washers

For Vertical Bolts

Width Channels: 3 by 3 by ⅜ in.
With Roof Ties: 4 by 4 by ⅜ in.
Holes: ⅛ in. larger than bolt.

Submitted December 1950

Subcommittee on Specifications

W. D. NORTHOVER, *Chairman.*
J. DEMPSEY
J. R. LONG
G. P. MAHOOD
J. H. SANFORD
E. M. THOMAS
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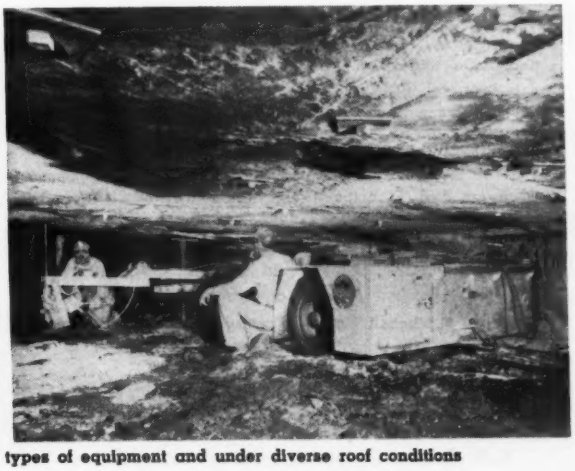


Bolting materials must be standardized for use with all types of equipment and under diverse roof conditions

Plans Completed for 1951 Coal Show

C. J. POTTER
National Chairman
Program Committee

THE coal industry is mobilizing for defense production and will be ready, if called upon, once more to set and break tonnage records in supplying the fuel and power to operate our country's mills, factories, railroads and chemical plants. It is a job that calls for complete coordination and teamwork—manufacturers and operators must formulate plans and work together to carry them out. Mining must be prepared to take fullest advantage of its resources in men and machines and to operate at highest productive levels in spite of any restrictions placed on materials or manpower.

To make the 1951 Coal Convention and Exposition a direct contribution to the nation's defense effort, the Program Committee has chosen topics and speakers calculated to help the industry attain its objective. Appropriately opening with an address on "Coal and National Defense," the sessions will continue with papers on

(*Continued on page* 65)

Advance Program

MONDAY—MAY 14

2:00 pm—National Defense—Public Relations

Coal and National Defense.
To Be Announced.

Public Relations—A presentation by speakers from Anthracite and Bituminous Fields giving an overall account of what is being done by mining companies to bring to the country, to local communities and to company employes a better knowledge of the coal industry and its importance in our national economy.

Public Relations in the Anthracite Industry:
F. W. Earnest, Jr., President, Anthracite Institute.

Employe Communications:
George Van Hagan, Director of Personnel, Peabody Coal Co.

Mining Community Activities:
J. E. Elkin, Gen. Supt., Coal Dept., Duquesne Light Co.

TUESDAY—MAY 15

10:00 am—Coal Preparation Session

A Panel Discussion on Problems and Solutions—Covering all phases of wet and dry methods as used at Anthracite and Bituminous preparation plants, and including problems of refuse handling to prevent stream and air polution.

Wet Cleaning Fine Coal:
Byron Bird, Technical Consultant, Jeffrey Mfg. Co.

Current Practices in Air Cleaning:
W. C. McCulloch, Roberts & Schaefer Co.

Recent Developments in Coarse Coal Cleaning:
David R. Mitchell, Head, Department of Mineral Engineering, Penn State College.

Cleaning Small Sizes of Anthracite:
James Hannigan, Supt. of Preparation, Glen Alden Coal Co.

Related Problems of Mechanical Coal Cleaning:
F. P. Calhoun, Rochester & Pittsburgh Coal Co.

10:00 am—Maintenance and Power Session

Planning For Preventive Maintenance—All machines are subject to breakdowns that will seriously affect production unless preventive measures are planned and carried out.

W. E. Wolfe, Plant Superintendent, National Electric Coil Co.

Underground Maintenance Organization—A well organized maintenance department with adequate facilities and trained personnel is needed to keep equipment in production.

William McGregor, Chief Electrician, Bell & Zoller Coal & Mng. Co.

Lubrication of Mining Equipment—An extremely important factor in machine production is proper lubrication, and this paper outlines the practices of a large coal company covering their on-shift, between-shift and periodic overall shop methods.

V. O. Murray, Gen. Mgr., Union Pacific Coal Co.

The Economics of Automatic Centralized Lubrication of Coal Mining Machinery—Describing the so-called "one-shot" lubrication method, giving the economies of such a system and its effect in reducing maintenance and eliminating manual greasing.

L. W. Deutsch, Sales Mgr., Trabon Engineering Corp.
J. B. Anderson, Supervising Engineer, The Texas Co.

Comparison of AC and DC Systems For Underground Mines—Discusses the fundamentals of AC power applied to face equipment and gives comparisons between AC and DC systems for mining service covering installation, operation and costs.

J. Z. Linsenmeyer, and **A. G. Owen**, Westinghouse Electric Corp.

2:15 pm—Roof Support Session

Roof Bolting With Large Mobile Equipment—Giving the experiences of a company that has pioneered coal mine roof bolting and has contributed much toward the development of equipment and technique.

John K. Berry, Prod. Engr., Consolidation Coal Co. (Ky.)

Roof Bolting In Thin Seams With Portable Equipment—Describing various types of portable equipment now being developed for low coal, including self-propelling trucks and those moved by

manpower, with performances under various conditions.

C. E. Hough, Vice-President, Imperial Smokeless Coal Co.

Geological Considerations In Roof Bolting—The character of the mine roof strata determines the roof action and a geological study of the overlying measures can indicate what method of support will prove most effective.

Paul H. Price, State Geologist, and

A. T. Cross, Geologist, West Virginia Geological Survey.

Roof Bolting With Dust Control Equipment—Explains the types of roof rock where dust control is and is not required and covers both wet and dry drilling together with the effectiveness of several types of dust control measures that are in experimental or actual operation.

James Westfield, Chief, Accident Prevention and Health Division, District VIII, U. S. Bureau of Mines.

Combined Coal Drill and Timber Setting Machine—In addition to bolting, progress is being made in the more conventional methods of mine roof support, and this paper describes a machine to replace hand labor for cutting and setting timbers.

Clarence M. Hays, Division Engineer, Pittsburgh Coal Co.

2:15 pm—Strip Mining Session

Symposium on Overburden Drilling—Giving a short history of past drilling practices leading up to the development of new methods and improved equipment to make better fragmentation in the overburden and improve the efficiency of shovels and draglines.

Compressed Air in Vertical Drilling

W. J. Crawford, Vice-President, Enos Coal Mining Co.

Selective Elevation Horizontal Drilling

Donald D. Saxton, Superintendent, Stripping Operations, Hanna Coal Co.

Other Late Developments in Overburden Drilling

Gene H. Utterback, Chief Engineer, United Electric Coal Cos.

Drilling and Blasting in Two-Seam Stripping—Describes an unusual strip operation where two seams are mined simultaneously, giving details of seams and strata together with the mining procedure for drilling, blasting and removing light and heavy overburden.

Russell Badgett, Jr., Secretary, Badgett Mine Stripping Corp.

2:00 pm—Manufacturers Division Meeting

Including discussion of materials procurement problems

WEDNESDAY—MAY 16

10:00 am—Mechanical Mining Session

Mechanical Loading with Bridge Conveyors—Describing an installation designed to approach continuous production with a conventional mechanical loader by means of improved methods in face preparation and service haulage.

A. B. Crichton, Jr., Vice-President, Johnstown Coal & Coke Co.

Trackless Mining in 30-Inch Coal—Shows that a conventional loading machine may be operated at high efficiency in low coal through the proper selection and use of the auxiliary equipment.

Irvin C. Spotte, Princess Elkhorn Coal Co.

Main Entry Development in Low Coal—Explains how the rock brushing and the track work for a main haulage road must be scheduled to coordinate with the advancement in the other entries that are working only in coal.

W. D. Hawley, Gen. Supt., Eastern Gas & Fuel Associates.

Mechanical Mining in Anthracite—Giving accounts of what is being done to recover pillar coal in anthracite mining, why small lightweight equipment was developed, and what is hoped to be accomplished in the future.

E. F. Young, Mng. Engr., Philadelphia & Reading C. & I. Co.

W. I. Stonebraker, Colliery Supt., Hudson Coal Co.

10.00 am—Safety Session

Protection Against Electrical Hazards in Coal Mining—Much has been done toward elimination of electrocution and ignition hazards from electrical equipment but further consideration can accomplish much more in creating safer working conditions.

George C. Barnes, Professor, Virginia Polytechnic Institute.

Pulmonary Diseases as Related to Coal Mining—To accompany the progress in accident prevention, this paper points out how to combat certain health hazards that may exist.

Dr. A. J. Vorwald, Director, Trudeau Foundation.

Advances in Illumination for Coal Mines—The authors give specific suggestions for improving reflectance, brightness and contrasts of visual tasks to improve "seeing" underground.

G. F. Prideaux and **C. M. Crysler,** General Electric Co.

Permissibility of Diesel Locomotives for Coal Mining—An impartial discussion of a controversial question, to show what mining service is considered practicable for this type of equipment and what are the limitations on its use.

J. H. East, Jr., Regional Director, U. S. Bureau of Mines.

10:00 am—Purchasing Agents Round Table

Discussion leaders to be announced.

2:15 pm—Continuous Mining Session

A Symposium Covering Machines and Operating Methods—By operators and manufacturers, describing continuous machines now on the market, together with the mining plans used and results being obtained.

Gerald Von Stroh, Director, Mining Development Committee, Bituminous Coal Research.

A. Lee Barrett, Joy Mfg. Co.

M. F. Cunningham, Vice-President, Goodman Mfg. Co.

E. M. Arentzen, President, Lee-Norse Co.

W. J. Phillips, Sunnyhill Coal Co.

Coordinating the Auxiliary Operations of Continuous Mining—An explanation of how haulage, roof support, slate handling, power, ventilation and maintenance must be cycled in a continuous operation to supplement the mining machine.

T. L. Aitken, Vice-President, Ebensburg Coal Co.

Harold B. Wickey, Vice-Pres., Pennsylvania Coal & Coke Corp.

Slope Driving with a Continuous Machine—An unusual application of coal mining equipment sinks a conveyor slope from the surface to the underground seam.

H. A. Treadwell, Vice-President, Chicago, Wilmington & Franklin Coal Co.

2:15 pm—Strip Mining Session

Torque Converters in Strip Mine Haulage Units—Describes the design and application of this device to off-highway trucks and explains how it affects the efficiency of the haulage operation.

R. M. Schaeffer, Eng., Allison Div., General Motors Corp.

Large Augers for Highwall Mining—A history of auger development and a discussion of its application to highwall mining in the Pittsburgh coal, covering type of heads, diameter and length of holes, size consist and percentage of recovery.

Charles E. Compton, President, Grafton Coal Co.

D. M. Bondurant, Assistant Professor of Mining Engineering, West Virginia University.

Stripped Land Use Developments

To Be Announced.

THURSDAY—MAY 17

10:00 am—Coal Utilization Session

Problems of Industrial Mobilization

To Be Announced.

Increasing Coal's Market—A presentation by three speakers describing research and experiments now under way to increase the efficiency of coal combustion methods and to widen the by-product field through the development of new synthetics.

Research for Future Uses of Coal

Dr. A. A. Potter, President, Bituminous Coal Research.

New Developments in Coal Burning Locomotives

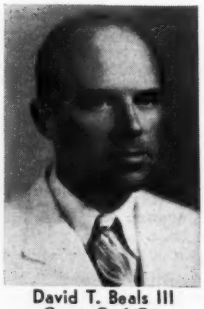
George D. Creelman, Director of Research, M. A. Hanna Co.

Cyclone Furnace Develops High Combustion Efficiency

Merle Newkirk, Power Manager, Dow Chemical Co.

Members—Program Committee

E. M. Arentzen
Lee Norse Co.



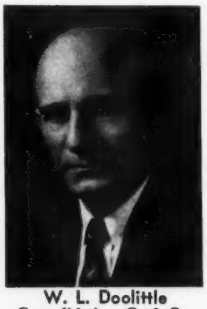
David T. Beals III
Crowe Coal Co.

Wm. Beury
Algoma Coal & Coke Co.

K. R. Bixby
Bixby-Zimmer Engineering Co.

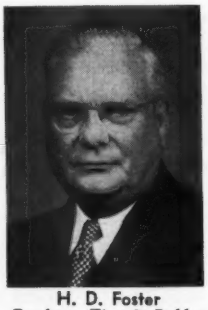
Nelson L. Davis
Nelson L. Davis & Co.

H. A. Dierks
Glen Alden Coal Co.



W. L. Doolittle
Consolidation Coal Co. (West Virginia)

J. S. Forman
Mt. Olive & Staunton Coal Co.



H. D. Foster
Goodyear Tire & Rubber Co.

J. H. Fulford
Jeffrey Mfg. Co.

C. A. Gibbons
The M. A. Hanna Co.

Wm. E. Goodman
Goodman Mfg. Co.

C. A. Hamil
Sycamore Coal Co.

R. G. Heers
Kaiser Co., Inc.

A. K. Hert
Snow Hill Coal Corp.

E. M. Heuston
Bucyrus-Erie Co.

J. P. Horne
Jewell Ridge Coal Corp.

S. B. Johnson, Jr.
The Lorado Coal Mining Co.

J. M. Kerr
Berwind-White Coal Mining Co.

R. E. Kirk
Tenn. Coal, Iron & RR Co.

1951 Coal Show

(*Continued from page 62*)

major phases of mining and preparation covering the latest developments in equipment and operating methods. The Manufacturers Division meeting and the Purchasing Agents Round Table will give special attention to materials procurement. The Convention will close on Thursday morning with a discussion on "Problems of Industrial Mobilization" and an overall review of research under way to develop new by-products and to improve the combustion efficiency of coal for industrial, railroad and domestic uses.

To demonstrate what has been done and what the future holds in store in the way of mining machinery, coal beneficiation machinery and auxiliary equipment and supplies, the exposition will feature exhibits of 239 manufacturers. The displays will be manned by technical experts sent to discuss operating problems and render assistance to the large numbers of practical mining men who will attend. The informal exchanges of ideas which result from these discussions are valuable complements to the more

(*Continued on page 76*)

(*Photos not available*)

W. A. Borries
Dawson Collieries, Inc.

C. A. Peterson
Northwestern Mining & Exchange Co.

L. J. Walker
Chicago Pneumatic Tool Co.

H. B. Wickey
Pennsylvania Coal & Coke Corp.

T. R. Workman
West Virginia Coal & Coke Corp.

Frank E. Mueller
Roberts & Schaefer Co.

J. T. Parker
Inland Steel Co.

F. S. Pfahler
Superior Coal Co.

E. M. Platts
Joy Mfg. Co.

H. A. Reid
United Electric Coal Cos.

H. C. Rose
Pittsburgh Coal Co.

A. J. Ruffini
North American Coal Corp.

John T. Ryan, Jr.
Mine Safety Appliances Co.

J. H. Sanford
Ohio Brass Co.

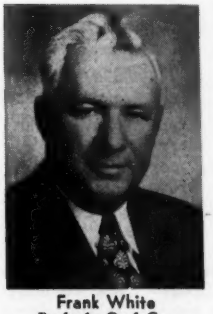
L. G. Schraub
Union Wire Rope Corp.

Chester G. Sensenich
Irwin Foundry & Mine Car Co.

Van B. Stith
Anchor Coal Co.

R. H. Swallow
Ayrshire Collieries Corp.

J. William Wetter
Rockhill Coal Co.



Frank White
Peabody Coal Co.

R. Y. Williams
Consulting Engineer

W. A. Wirene
General Electric Co.

Wm. P. Young
Bell & Zoller Coal & Mining Co.

AMC Personals

The American Institute of Mining and Metallurgical Engineers, at their recent meeting in St. Louis, presented the Charles F. Rand Medal for 1951 to **James Draper Francis**, of Huntington, W. Va., chairman of the board of directors of Island Creek Coal Co., Pond Creek Pocahontas Co., and affiliated companies. It was awarded to him as one of the nation's leading industrialists and in particular for his significant contributions to the progress of the coal industry during the past third-of-a-century, as well as his deep interest in civic affairs, local and national.

J. D. Francis

The citation accompanying the presentation to Mr. Francis read, "for successfully administering coal properties for more than 35 years until these two companies have become one of the largest and most successful units in the coal industry; for opening and managing new properties, for improvements in marketing and business methods, for his general interest in all industrial matters, his continued interest in research and his excellent citizenship in promoting not only his own, but all other interests in his general community."

Mr. Francis is the seventh distinguished American to receive the medal since the Rand Foundation was established in 1930.

C. N. Schuette, consulting mining and metallurgical engineer, has moved his offices to 6390 Barnett Valley Road W., Sebastopol, Calif.

James S. Laird has been appointed general superintendent of The Gay Coal & Coke Co. and Gay Mining Co. with offices at Mount Gay, W. Va., as of March 1, 1951.

Since his graduation from V. P. I. in 1936 he has served in various capacities for the Eastern Gas & Fuel Associates in the engineering crews, assistant mine foreman and superintendent. For the past two years he has been assistant to the general manager of the Gay Companies. Prior to coming with these companies he was an industrial engineer for the Island Creek Coal Co.

He was in the service five years, three years over seas in the Pacific Theatre, and was discharged with the rank of major.

Secretary of Labor Maurice J. Tobin has announced the appointment of **William L. Connolly**, director of the Bureau of Labor Standards, as chairman of the Federal Safety Council. Mr. Connolly has assumed his new assignment in addition to his present duties.

Thomas E. Lightfoot, director of welfare and insurance, Eastern Gas & Fuel Associates, coal division, recently retired from his insurance duties. He will continue to give his attention to the two summer camps for the children of the company's mine workers.

James K. Richardson, industrial engineer, Western Division, Kennecott Copper Corp., has finished his stint in Washington and in accordance with Defense Minerals Administration's policy of rotating the "best man for the job" has returned to Salt Lake City, where he will continue to be available to DMA in a consulting capacity.

Tom Lyon, formerly with International Smelting & Refining Co., has replaced **S. H. Williston** as chief of Defense Minerals Administration's supply division. Williston has returned to his post as vice-president, Cordero Mining Co.

Otto Herres' appointment as head of the zinc-lead branch of DMA has been confirmed. He is on leave of absence from Combined Metals Reduction Co. and has been serving in his present capacity ever since the establishment of DMA.

Allen H. Engelhardt, associated for the last 20 years with South American Development Co., was recently appointed assistant manager of operations for the Cerro de Pasco Copper Corp. in La Oroya, Peru. **A. R. Merz** is manager of operations at La Oroya.

Dr. Bruce W. Gonser has been named to the post of a newly created assistant directorship at Battelle Memorial Institute. Dr. Gonser will guide development of Battelle's enlarged program in up-to-now unexplored fields of metallurgy and the chemistry of metals. A veteran member of the institute's staff, he will continue also to direct much research in nonferrous metallurgy.

E. G. Shell, general manager of mines, Lorain Coal and Dock Co., and **L. F. Workman**, general manager of mines, Lorado Coal Mining Co., have been named advisory members to the junior executive committee of the Lorain Coal and Dock Co.

L. E. Cole, manager of United States Metals Refining Co., has been promoted to consultant on copper smelting and refining problems. **Freeman H. Dyke** will assume the position formerly held by Mr. Cole.

C. E. Hough, vice-president, Imperial Smokeless Coal Co., Quinwood, W. Va., announces the appointment of **H. B. Jones** as general manager.

Mr. Jones comes to Imperial from The New River Co., Mount Hope, W. Va., where he has been employed for the past 17 years. He was, at the time of his recent appointment, superintendent of the Garden Ground mine of the New River Co.

Mr. Jones is a graduate in mining engineering from West Virginia University, Morgantown, W. Va., class of 1927.

James R. Johnson, previously with Kennecott Copper Corp. at Ray, Ariz., is now mining engineer for the Zonolite Co. at its vermiculite deposit on Rainy Mountain above Libby, Mont.

Charles R. Griffith, president, Southern Coal and Coke Co., was recently elected president of the Southern Appalachian Coal Operators' Association. He succeeds the late Lee C. Gunter. **B. E. Cheely** was elected first vice-president, **D. E. Griffith**, second vice-president; and **C. W. Davis**, secretary.

Oscar S. Straus, treasurer of American Smelting and Refining Co., was recently elected a director of the company. He was elected treasurer of the company and of Federal Mining and Smelting Co. in 1949.

John J. Foster, vice-president, Island Creek Coal Co., Huntington, W. Va., has been elected president of the Logan Coal Operators Association according to a recent announcement. He succeeds **Arthur Downing** in this post. Foster was also made a member of the executive committee at a meeting in Huntington last month. Other officers named at this time were: **W. W. Beddow**, vice-president; **H. A. McAllister reelected** executive director, and **J. W. Colley** who is to continue as secretary-treasurer.

Also named to the executive committee were **R. E. Salvati**, president, Island Creek Coal Co.; **H. E. Jones**, Logan County Coal Corp.; **G. J. Stoll-**

D. A. CALLAHAN
Vice-President
American Mining Congress

IN reporting our Annual Members' Meeting on pages 44 and 48 of the January issue, omission was made of the reelection of Donald A. Callahan, president, Callahan Consolidated Mines, Inc., of Wallace, Idaho, as vice-president of the American Mining Congress. For many years an outstanding leader in the mining industry, Mr. Callahan has repeatedly rendered invaluable service in his splendid appearances before the committees of the Congress on crucial issues vitally affecting metal and mineral producers.

ings, Powellton Coal Co.; **J. A. Kelly**, Guyan-Eagle Coal Co.; **S. B. Johnson, Jr.**, Lorado Coal Mining Co.; **O. G. Schwant**, Hutchinson Coal Co.; **T. R. Workman**, West Virginia Coal & Coke Corp.; **Dr. K. J. Heatherman**, Jones & Heatherman Coal Co.; **A. P. Boxley**, Eastern Gas & Fuel Associates.

Berwind White Coal Mining Co. announced the appointment of **J. J. Sellers** as treasurer of the following affiliated companies: New River & Pocahontas Coal Co., Fayette Land & Improvement Co., the Wilmore Coal Co., Richland Township Water Co., Windber Electric Corp., Windber Heating Co., Kentland Coal & Coke Co., Kentland Elkhorn Coal Co. and Eureka Stores. The treasurer's office will continue to be located in the Pennsylvania Bldg., Philadelphia, Pa.

A. P. Morris, formerly pit superintendent of Chino mines division, Kennecott Copper Corp., has been made assistant to the general manager of Kennecott operations at Ray, Ariz.

William Hardy, superintendent, mine 52, Peabody Coal Co., retired recently after 37 years service. **Ned Dangerfield**, with mine No. 14 in a supervisory position, retired after 60 years of coal mining experience.

C. A. Kral, Chilean management representative for Koppers Co., Inc., at Concepcion, Chile, has been appointed a vice-president in Koppers engineering and construction division.

Koppers supervised the construction of a new integrated steel mill near Concepcion for the Pacific Steel Co. of Chile and is continuing to give supervisory assistance in the operation of the plant for a period of years. Mr. Kral will now become Koppers representative on the board of directors of Pacific Steel Co., replacing **W. C. Snyder, Jr.**, vice-president in charge of the metallurgical department of Koppers engineering and construction division, whose duties keep him in this country most of the time.

James Parnell Caulfield was recently appointed general manager of the Utah copper division of Kennecott Copper Corp. Caulfield was formerly general superintendent of Hudson Bay Mining and Smelting Co., Ltd., and general manager of Hudson Bay Exploration and Development Co. in Canada. **Louis Buchman**, general manager western mining operations for Kennecott, has been handling the duties now assigned to Caulfield in addition to his regular tasks.

Irving S. Olds, chairman of the board of directors of United States Steel Corp., recently announced that **Herbert E. Smith** was elected a director of the corporation and a member of its finance committee, succeeding the late Robert C. Stanley. Mr. Smith is chairman of the board and chief executive officer of United States Rubber Co.

William W. Lynch has been named vice-president of Calumet and Hecla Consolidated Copper Co.

Clyde W. Woosley, Pinckeyville, Ill., was appointed director, Division of Equipment and Materials for Defense Solid Fuels Administration. For three years prior to retirement in 1950 he was general purchasing agent for Binkley Coal Co. of Chicago and for 15 years previous was superintendent of that company's Illinois properties. Woolsey's duties will cover the field of mining equipment and material requirements as they affect solid fuels.

Edward G. Budd, Jr., president, The Budd Co., and **James H. Robins**, president, American Pulley Co., have been appointed vice-presidents of The Franklin Institute. **A. Felix duPont, Jr.**, has been elected a member of the institute's board together with **Dr. James Cresse**, president of the Drexel Institute of Technology.

—*Obituaries*—

R. H. Morris, vice-president of the Gauley Mountain Coal Co., Ansted, W. Va., died at Charleston, W. Va., on March 1. An alumnus of Ohio State University, past president of the West Virginia Coal Mining Institute and of the New River Association, Mr. Morris has always been very active in coal affairs and was widely known throughout the industry.

Ralph D. Pomeroy, 79, retired vice-president of Utah Fuel Co., died February 5 in Salt Lake City. He joined Utah Fuel Co. in 1903 and became vice-president in 1944. He retired in 1950 and was one of the best known leaders in the western coal mining industry.

August Grunert, mining consultant of Butte, Mont., died February 4 in Butte. A native of Poland he had been engaged in mining work in Montana since his graduation from Montana School of Mines. He formerly was president of the Western Iron Works of Butte.

Walter Geist, 56, president of Allis-Chalmers Mfg. Co. since 1942, died recently in Milwaukee. Mr. Geist joined Allis-Chalmers in 1909 and in 1928 was named assistant manager. He developed the multiple V-belt Texrope drive while engineer in charge of transmission in the milling department. In 1933, Geist was named general sales representative for the general machinery division and in 1939 was elected a vice-president of that division. In early 1942 he was elected as executive vice-president and later in the year was elected president.

In addition to his duties for the company Mr. Geist found time for activity in civic and educational affairs and received honorary degrees from several universities and engineering schools.

Henry Thies, 59, manager of the northeastern sales division, Joy Mfg. Co., died in Pittsburgh recently. He joined the Joy organization in 1935 and was widely known in coal mining ciricles throughout the United States and Canada.

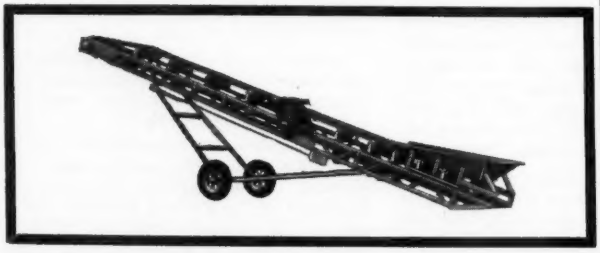
Robert Crooks Stanley, chairman of the board of directors, International Nickel Co. of Canada, Ltd., died recently at the age of 74.

Mr. Stanley was born in Little Falls, N. J., in 1876. He received his mechanical engineering degree at Stevens Institute of Technology in 1899 and a degree of mining engineer at Columbia School of Mines in New York City in 1901. Since that year, when he became associated with one of its predecessor companies, Mr. Stanley has provided the leadership through which International Nickel has emerged as one of the world's leading and most successful mining and metallurgical enterprises. Numerous honors have been bestowed on Mr. Stanley and his outstanding leadership in the nickel industry brought him wide recognition in many fields.

Delivered PROMPTLY

A typical installation of Sectional Conveyor assemblies "Job-Fitted" to the efficient operation of this aggregate plant.

TODAY three major factors must be considered in the purchase of material handling equipment—performance, price and *delivery*. Baughman Sectional Hi Speed Job-Fitted Conveyor assemblies are built to meet these specifications. Each Baughman Sectional Conveyor is engineered, thoroughly tested and load rated, insuring satisfaction in every installation. Through quantity production of Sectional Conveyor Assemblies it is possible to stock basic units, which insure prompt delivery at lower cost.



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CONCENTRATING TABLES
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1. Variable speed control—200 to 400 RPM.
2. Adjustable stroke length—¾" to 1¼".
3. Choice of riffle design.
4. Table deck 7' wide of selected California redwood on white pine frame reinforced with steel—light and strong.
5. Deck covering of special sheet rubber.
6. Table frame of channel steel with oil immersed rocker bearings and positive tilting mechanism for any slope up to 2" per foot.

THE WILFLEY TABLE is an economical and efficient means of gravity concentration particularly suited to coal preparation requirements. The simple mechanism cuts upkeep. Our engineering staff is at your service. *Write Direct.*

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Sales Offices in Salt Lake City, El Paso, 1775 Broadway, N.Y.C.

"Mine" Scrap Iron

In the grass-covered hills of slag near Coatesville, Pa., are quantities of scrap and waste skimmed from cooking metal in near-by mills during the last half century. One of these five slag hills is being worked by Brown Brothers Construction Co., Inc., of Coatesville, who estimate the hill to contain 6,000,000 cu yd. They have recovered as much as 3500 tons of scrap iron in a single month. In the operation, the company picks up the slag hill and sets it down again after removing the metal by means of a magnet.

Maryland Mobile Rescue Station

A new phase in the mine rescue and first aid training program of the state of Maryland was inaugurated by the recent delivery of the first mobile rescue station to the Maryland Bureau of Mines. Developed for the Bureau by the Mine Safety Appliances Co., the Station can transport all necessary material and equipment for instruction and practice of safety and first aid activities, as well as rescue work in case of fires and explosions. The all-steel body mounted on one and a half ton truck chassis, with two-speed axle and oversize tires, can reach even the smaller mines throughout the state.

The unit will be located at Kitzmiller, Md., near the Bureau's rescue station. Two full-time rescue crews, a captain and five men each, are maintained by the Bureau in addition to a volunteer gas mask crew of six men on call. Frank Powers, director of the Maryland Bureau of Mines, said the mobile station will also stimulate interest in safety when it makes its appearance at the mines.

Acquire River Tipple Site

Consolidated Coal Co. (Ky.), a division of Pittsburgh Consolidation Coal Co., Jenkins, Ky., has announced the acquisition of a property in Ashland, Ky., for future operation of a river tipple and a coal storage yard.

The property is located between the Ohio River and the main line of the Chesapeake & Ohio Railway and, until recently, had been used as an airport for small planes.

Facilities will be eventually erected by Consolidation for the unloading, storage and reloading of coal for shipment by either rail or river. River shipments will necessitate the erection of a tipple with suitable docks. No definite plans for construction have yet been made.

ECA Host to Mill Men

About 40 top flight mill men from 14 Marshall Plan countries are to be guests of ECA for a seven weeks' tour of the United States to study operations here, according to Paul E. Tyler, consultant to ECA, who is making the arrangements for the project. The group will be divided into three teams the better to introduce the visitors to American know-how, functioning on its home grounds. One group will tour the plants of the lead-zinc industry; another will specialize in copper, while the third group will study various phases of metallic and nonmetallic minerals beneficiation practice.

This project is one of a series designed to acquaint European operating men with American methods to the end that they can adapt our methods to their own conditions and thus increase efficiency and eventually lighten the burdens the Marshall Plan has placed on American industry and taxpayers.

The group is slated to arrive in this country on March 26 and following a briefing in Washington will start on tour.

WANTED

Mining Congress Journal offers opportunity to recent mining graduate with coal production experience. Position involves writing and working with members of mining industry.

Address inquiries to the Editor. Include information on education, experience, marital and draft status and a recent photograph.

Expect Foreign Ore Shipment

Early in April the Baltimore & Ohio Railroad expects to complete its new ore pier at Baltimore, it was announced recently. Under construction for more than a year, the B. & O. facility is the first of its kind to be built on the eastern seaboard. It is designed to handle the flow of imported iron ores which will soon supplement the nation's internal ore supply.

Iron ore from Liberia, on the west coast of Africa, and ores from the newly discovered deposits in Venezuela will be unloaded by the pier's two unloading machines. Each of these machines has a rated unloading capacity of 1500 tons of ore per hour, and a sustained capacity of 1000 tons per hour. First shipments are expected to arrive shortly after completion of the facility. Construction was begun in January 1950 by the Empire Construction Co. The Dravo Corp. of Pittsburgh is handling the superstructure work and dredging is being done by the Arundel Corp.

New Research Center

Establishment of a National Asphalt Research Center by the Franklin Institute Laboratories for Research and Development took place in Philadelphia January 29 to serve the asphalt industry in the United States.

More than twenty prominent corporations from coast to coast, representing oil, roofing, molded products, sealing compounds, and allied industries are sponsoring the new organization.

Asphalt has been for centuries the material most widely used for waterproof binders and coatings. Its chemical characteristics and physical structure are complex, and there is special need today for new knowledge of its fundamental properties and for practical ways to use such knowledge to develop improved products and new markets.

During three years' work on specific projects, the Franklin Institute Laboratories for Research and Development discovered the need for an organization devoted to carrying out research on basic and practical problems which are common to the makers and users of asphalt. When the subject was discussed with companies in the industry they too agreed to the existence of such a need and agreed to support it.

Details of scientific matters discussed at these sessions follow:

Important in most applications of asphalt are its pouring and penetrating properties, cold flow or creep, stickiness or tack, ductility, brittleness, hardness, toughness, pliability, joint strength, penetration by water, age-hardening, fatigue, strength, adhesion of granules, and sometimes grindability, abrasion resistance, effect of solid fillers, demolding properties, etc. All of these engineering requirements are functions of elasticity, plasticity, viscosity, and adhesion to solid surfaces at various temperatures and rates of shear. It is proposed that the major work of the NARC during the first year be to devise practical and scientifically correct methods for measuring these four basic properties.

Educational Speedup

Rensselaer Polytechnic Institute of Troy, N. Y., recently announced that starting in July it will adopt the year-round quarter system, admitting students four times each year and permitting them to graduate in three years. Those who wish to do so, however, may continue at the normal pace.

Dr. L. W. Houston, president of the college, in announcing the shift from the conventional fall-spring semester plan said that the institute wishes to use its full resources to meet the acute shortage of engineers and scientists now reported by government and defense industry. Under the new plan, if Congress permits, June high school graduates may enter college in July, begin reserve officer training work and expect to have three years of college to qualify for special jobs in the armed forces or essential industry. Men returning from military service may enter college without long delay.

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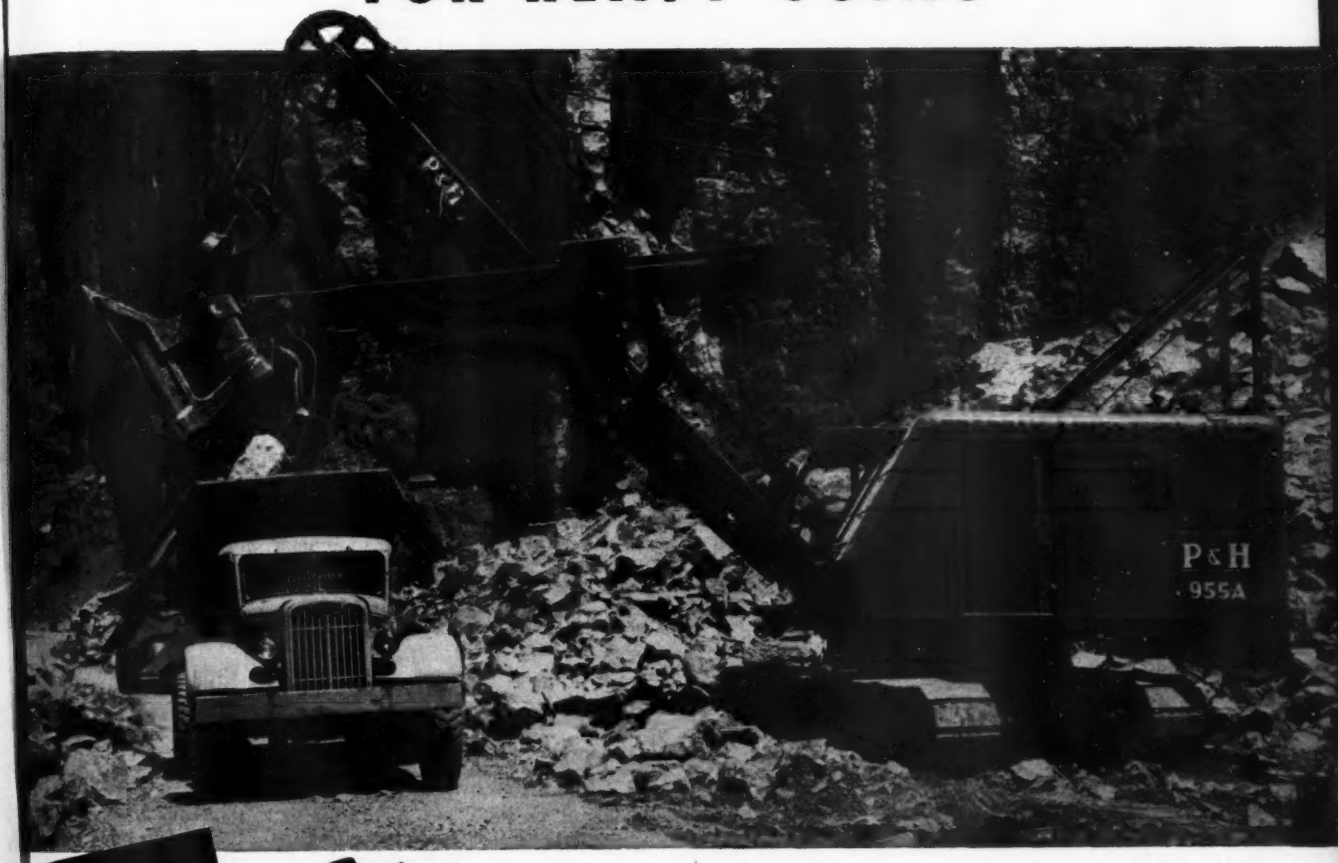

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SMOOTHER OPERATION means less strain on machine and operator. **GREATER STABILITY** gives you increased digging ability. **ALL-WELDED** for maximum strength.

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AEC Wants Men

The U. S. Atomic Energy Commission needs experienced geologists and mining engineers in its Raw Materials Operations. Positions are located in New York City and Grand Junction, Colorado. Beginning salaries from $4,600 (GS-9) to $8,800 (GS-14), depending on experience. Minimum experience three years. Civil Service status not required. Those interested should write to U. S. Atomic Energy Commission, 70 Columbus Avenue, New York 23, N. Y., attention Robert D. Nininger, Raw Materials Operations.

Coal, Aluminum, Power-Team

At New Haven, W. Va., Henry J. Kaiser is building an aluminum plant right beside a coal mine; close by is an electric generating plant of the American Gas & Electric Co.

Coal is brought into the generating boilers on conveyor belts direct from the mines. Electric power is then sent next door to the aluminum plant. Since it takes about seven times as much energy to make aluminum as it does steel, the cost of power is an important element in determining the cost of aluminum. To get low power cost, the aluminum plant has been brought to the coal mine, thus effecting enormous savings in handling and transportation costs.

The program is a part of aluminum producers' project to double present capacity.

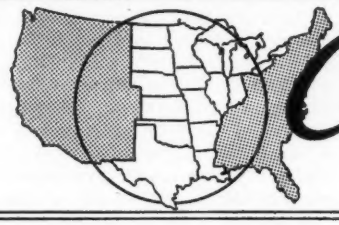
New Coal Cars Ordered

In preparation for the increased demand for coal which is expected as defense industries get under way, the Chesapeake & Ohio Railway has placed orders for a total of 5500 hopper cars with a capacity of 70 tons each. The cars are to be built at American Car & Foundry Co.'s Huntington, W. Va., plant.

New Association Formed

A recently formed organization called "National Council of Coal Lessors, Inc.," will deal primarily with tax matters involved in the ownership of coal land and leased coal lands. The officers of the new organization are Rolla D. Campbell, Huntington, W. Va., president; James W. Haley, Arlington, Va., vice-president; J. M. B. Lewis, Jr., Bluefield, W. Va., secretary; and Roger F. Cooper, Lexington, Ky., treasurer.

The first tax inequity to be brought to the attention of the Congress is that which taxes royalty income from coal lands as regular income. The association claims that since this type of income is a result of a piecemeal sale of the coal in the land, it should be recognized as a capital gain and taxed as such.



Central States

Win Freedoms Foundation Awards

Stanley B. Johnson, president of The Lorain Coal & Dock Co. and The Lorado Coal Mining Co. of Ohio, and *The Lorain-Lorado Journal*, monthly employes' magazine of both companies, received Freedoms Foundation Awards for outstanding achievement in bringing about a better understanding of the American way of life during 1950. These are the first Freedoms Foundation Awards ever received by coal mining companies.

S. B. Johnson

Mr. Johnson received a fourth place award in the editorial category for his President's Corner, "Faith of Our Fathers," which appeared in the January, 1950, issue of *The Lorain-Lorado Journal*. *The Lorain-Lorado Journal*, edited by Harry C. Walter, personnel manager, received the second highest award in the company employe publications category.

H. C. Walter

The Lorain-Lorado Journal, published in the interest of the employes of both companies, was instituted in June, 1943 to keep employes in the armed forces posted on happenings at the mines, in their own communities and to keep them in touch with each other. The popularity of *The Journal* grew with each issue and when World War II hostilities ceased it had become an important and permanent part of the Company's employes' relations program and has been published regularly ever since.

Although *The Journal* is published for employes, many others have found it interesting and have asked to receive it regularly. Copies are mailed each month to 11 foreign countries, 28 states and the District of Columbia. These include customers, shareholders, labor organizations, coal associations, other mining companies, local, state and federal government officials, mining schools, related industries and others.

The year 1950 also marked the completion of half a century in the coal mining industry for The Lorain Coal & Dock Co., Columbus, Ohio; with sales offices in Cleveland, Ohio; and mining operations in Blaine, Belmont County, Ohio and Lorado, Logan County, W. Va.

Zinc Institute Announces Annual Meeting

The American Zinc Institute announced that its thirty-third annual meeting will be held at the Hotel Statler, St. Louis, Mo., on Monday and Tuesday, May 21 and 22.

Government officials will be present to discuss Washington plans and policies. Qualified speakers will review the general outlook for metals and the current situation in zinc mining and smelting production at home and abroad. The zinc consumption picture in each division of use will also be thoroughly covered. A preliminary program will be released in the near future.

The annual dinner and smoker will be held on Monday evening, May 21.

Buy Pig Iron Plant

In a joint statement John N. Marshall, chairman and president of Granite City Steel Co., and General Brehon Somervell, chairman and president of Koppers Co., Inc., announced the purchase of the Missouri-Illinois plant of Koppers Co., Inc., by the Granite City Steel Co., at Granite City, Ill.

The steel company took over operation of the plant which includes one 600-ton and one 500-ton blast furnace, a 49-oven coking plant and all other equipment to produce pig iron on February 3.

Marshall pointed out that the purchase fits into his company's expansion plans and will permit an increase in capacity with virtually the same working force, for the present. Continued expansion should result in more employment opportunities and still greater production.

Purchase Interest in Reserve Mining Co.

That National Steel Corp. has acquired a 15 percent interest in Reserve Mining Co. was announced recently by Ernest T. Weir, chairman.

The remaining interest in the company is owned by Armco Steel Corp. and Republic Steel Corp. When these companies acquired their joint interest in Reserve Mining Co. in September, 1950, the terms of sale of the stock held by one of the original owners included an option to National Steel Corp. to purchase from that owner an amount of stock equivalent to 15 percent of the total issued by the company. National Steel, after thorough study and analysis, has now exercised this option.

Reserve Mining Co. was organized to develop on an industrial basis processes which have been evolved through experimental work for the extraction of iron ore from taconite. The success of this operation will create a new and highly important source of iron ore within the borders of the United States.

Reserve Mining Co. controls iron ore deposits at the eastern end of the Mesabi Range in Minnesota which are estimated to contain 1,500,000,000 tons of taconite which should yield 500,000,000 tons of 60 percent ore.

New Iron Ore Deposit

The United States and Minnesota Geological Surveys have published three maps locating what experts said might prove to be a new and rich iron ore deposit in the northern part of that state. Dr. George M. Schwartz, University of Minnesota geologist and head of the Minnesota Survey, said the discovery was made in northern St. Louis County in a wilderness area between Embarrass and Bear Head Lake. It was found and mapped on the basis of an aeromagnetic survey.

Dr. Schwartz said the records disclose no prospecting has ever been done in the territory, which constitutes a southeastern extension of the rich Vermilion iron range. That range has been the source of ore assaying 60 to 65 percent pure iron, compared with 57 percent average for the Mesabi range. Dr. Schwartz made clear that ground exploration and drilling would be necessary before the new find is proved.

The aerial survey was carried out with the use of a magnetometer towed by an airplane. This device, called a doodle-bug, picks up and records fluctuations in the earth's magnetic pull. In the case of the reported new find it was towed at a 1000 ft altitude in paths approximately one mile apart. Dr. Schwartz reports that charts indicate the heaviest iron deposit is in a 20-mile square area near Soudan and Tower.

Wheels of Government

(*Continued from page* 59)

Nevada have introduced a bill providing for mine incentive production payments and exploration payments, not to exceed $100 million in any one year. The measure closely follows the Murray-Engle Mine Incentive Payments Bill in the 81st Congress, providing over-market payments, with escalator provisions against cost increases and including depreciation, amortization, depletion and a profit to the producer. The bill does not call for repayment of exploration grants.

Defense Minerals Administration

At a series of Advisory Committee meetings under the Defense Minerals Administration in late February and early March, there was general discussion of procedure for expanding and maintaining production of zinc, lead and copper.

The Zinc Advisory Committee discussed domestic exploration, procurement contracts, incentives for expanded production, domestic reserve, and manpower and equipment problems. The industry representatives proposed that there be a guaranteed "floor price" of 17.50 cents a pound for Prime Western zinc for a period of five years. It was suggested that zinc produced under such a guaranteed price be turned over to the Government if it could not be sold in the open market.

The Lead Advisory Committee, while stating that domestic supplies and requirements for lead are not far from balance, warned that consideration must be given to such factors as possible decline in imports, loss of manpower to the military services and the defense industries, and use of lead as a substitute for other metals. It was emphasized that expansion of lead production will be an important step toward reducing dependency on foreign sources of supply.

The Copper Advisory Committee was reported to feel that a proposed guaranteed minimum price plan for a five-year period would have relatively little effect on development of new deposits for mining lower-grade ores, but that it would tend to maintain current production.

Coal for Military Use

A most outstanding recognition of the importance of coal to the Nation is contained in the Munitions Board recommendation that all military installations and military-sponsored industrial facilities arrange to use the fuel most readily available under the present emergency conditions. Added to this, the Board declared that first preference should be given to the use of coal, second preference to natural gas, and third preference to fuel oil. The Board further said that coal is the nation's largest fuel resource and is available "except in west coast States." It was again emphasized that coal should be employed, as far as practicable, at all military facilities—both command and industrial, as well as military-sponsored industrial facilities.

The Board's memorandum to the armed forces stated that mine production in general is expected to meet over-all requirements, but in some areas there will be difficulty in obtaining delivery due to a shortage of coal cars. For this reason consideration should be given to obtaining requirements from the nearest mines even though quality is not up to that desired in normal times. Assurance of fuel supply and adjustments to defense needs should be basic guides in determining the fuel to be used.

Concerning the use of natural gas, the Board warned that it will be necessary to make sure that its availability will continue for a reasonable period of time and pointed out that demands for natural gas might outrun the expansion of pipelines and distribution systems.

Coal Properties Change Hands

A New York firm has made arrangements to acquire a controlling interest in the Consolidated Coal Co., of St. Louis, Mo., and has also, contracted to deliver the assets of the Consolidated Coal Co. to Zeigler Coal & Coke Co. of Chicago, Ill., at a date to be announced.

A. M. Rogers, president of Zeigler Coal & Coke Co., states "that the mines acquired from Consolidated Coal Co. will be operated by Bell & Zoller Coal and Mining Co., and that the coal will be sold by Bell & Zoller Coal Co., both of Chicago, Ill.

1951 Coal Show

(*Continued from page* 65)

formal operating sessions. In the five exhibit halls, previously used, and on the huge main floor will be gathered all the latest, worth-while aids to mechanized coal mining. Watch for the Preview of the Coal Show in the April issue, and plan to make the time spent at this greatest of all exhibitions pay the utmost in dividends of new ideas and know-how.

Fred Waring and his company of 58 of the world's top artists have been engaged to entertain the record crowd expected. There will be a single performance in the auditorium's Music Hall on Wednesday evening, May 16. This will be the only evening function at the 1951 Coal Show. Such an arrangement will permit ample opportunity for informal get-togethers and visiting—the renewal of old friendships and the making of new ones—not possible were the entertainment program more formal in character.

Streamlined Registration

Following the practice established at the 1949 Coal Show, registration will be expedited through early distribution of registration blanks to leading operating companies. When these blanks, properly filled out, are received, registration cards will be mailed well ahead of time. It will then be necessary only to present these cards at the door to obtain admittance.

Accommodations for the large number of visitors expected to attend the 1951 Coal Show in Cleveland May 14-17 are being handled by the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland 13. Exhibiting manufacturers have voluntarily reduced their own housing allotments to provide additional rooms for the mine operators attending the show. However, the extremely heavy attendance in prospect makes immediate application for accommodations advisable.

The Advance Program published herewith shows the wide range of important topics to be discussed at the meeting.

Trolley Phone

(*Continued from page* 37)

speaker unless a carrier current of approximately 100 kilocycles enters the circuit and at no time does the noise level exceed the signal strength.

The power pack consists of a simple resistance arrangement whereby 42 v. for the tube heaters and 275 v. for the plate screen circuit is taken from the 275 v. d-c mine power. The microphone is a simple carbon "mike" with a pushbutton built into the handle to operate the relay in the transceiver chassis. The speaker is a steel type, enclosed, with a volume control built in.

The mine trolley circuit is 275 v. On all mobile equipment the phone transmitter output is connected to the positive side of the haulage power circuit which, at Piney Fork, is the rail. The trolley wire is the return. The units at the shop and dispatcher's offices, which are four to five miles from the working part of the mine, have their output connected (through condensers) to the mine telephone line. For distances up to two miles the trolley-rail system alone would give satisfactory results but for longer distances it is necessary to use the phone line as a carrier in order to get good noise-free communication. To accomplish this, we install impedance-matching boxes which interconnect the trolley-rail power system and the mine telephone wires. The proper location for these boxes is found by experiment. We have had good results by spacing them at approximately 1000-ft intervals in the working parts of the mine and moving them forward as the mine advances.

Maintenance Costs Low

This equipment has not been in operation for a sufficient length of time to get a long-term picture of the maintenance cost. However, our experience to date indicates that our maintenance cost per unit should not exceed $4 per month and will, more than likely, average in the neighborhood of $3.75 per month. While the operating costs will vary with the amount of power used at the mine, on account of lower or higher rates, our cost at Piney Fork has been about $0.0025 per phone-hour.

The units are very sturdily constructed, and we have found that there is very little damage from shock or handling. The chief maintenance supply cost has been for replacement of tubes. In case of failure of a transceiver, microphone or speaker, the unit in question is replaced and the defective unit is sent to the shop. This change is made in a few minutes by removing the end cover from the case, disconnecting the various plugs, sliding one unit out, the other in, and reconnecting the plugs.

One man on the day shift makes the necessary repairs to all units including the periodic realignment of the tuning circuits in the transceiver. On an average, he spends one hour a day on trolley phone maintenance. We have a complete set of testing instruments including a tube tester and signal generator. Proper equipment is a big factor in cutting down the time involved in trolley phone maintenance. A well-trained man, plus good test equipment makes for quick and efficient trouble shooting. We keep on hand a complete line of tubes, resistors, condensors, etc., so there is no delay in waiting for parts.

The trolley phone has proved to be very practical for the applications we are making at Piney Fork mine. We know that it contributes greatly to the safety of the haulage operation and that there are countless ways in which it has and can improve productive efficiency underground. The initial cost and maintenance is well within reason when compared with the benefits derived from its use.

Western States

Production Problems Discussed at Denver

THE annual meeting of the Colorado Mining Association in Denver, February 1-3, highlighted the intense interest which is being taken in uranium production and discovery on the western slope of Colorado and adjacent areas in Utah, Arizona and New Mexico. One session of the convention was devoted to detailed consideration of the geology of the uranium ore occurrence and a further session under the chairmanship of Blair Burwell, the Association's new president, dealt with exploration and production. This latter session was made interesting and valuable by Mr. Burwell's leadership and discussion and by the plans, policies and procedures ably set forth by F. H. MacPherson of the Atomic Energy Commission and other well informed contributors.

Blair Burwell is new president of the Colorado Mining Association. He hails from Grand Junction and is vice-president and general manager of Climax Uranium Co.

Speakers at the well attended luncheon included Prof. Donald L. Kemmerer, economist, National Committee on Monetary Policy, who urged that confidence be restored in the dollar by immediate return to the gold coin standard at $35 per ounce. Frank Lilly of Spokane, followed Kemmerer in a discussion of the price of gold, recommending action as proposed in the resolution of the American Mining Congress, that the gold standard of the dollar be fixed at an amount determined by a monetary commission composed of men of recognized competence.

Senator Pat McCarran of Nevada presided at the "government-industry" session on the final morning of the meeting. The Senator had on the platform with him a panel composed of Jess Larsen, administrator, General Services Administration; James Boyd, director, Defense Minerals Administration; Harold Montag, requirements division, DMA; Otto Herres. zinc and lead section, DMA; and Carl Rolle, technical advisor, Munitions Board. The Senator called for production of metals and minerals essential to welfare and stressed the need of caring for the small miner.

Larsen, whose job is centralized procurement, said he knew that Government agencies had been unable thus far to meet the desires of marginal producers but that the defense authorities had cut through the red tape in order to get results. Boyd explained that the first thing must be to keep existing mines in production and that there is a program under way, which includes a simpler and better mine loan form, to aid exploration and development. Herres supplemented Boyd's statement by emphasizing that there are many good mines idle and that the first job is to put them to work. Montag detailed the work of his requirements division with regard to access roads, housing, manpower and electrical power and said a new "P-56" order for machinery, equipment and supplies to keep mines going is in the making. Rolle spoke of the stockpiling program and the problem of ascertaining what materials are needed and in what quantities.

Edward H. Snyder, president of Combined Metals Reduction Co., presided over the final afternoon session and called for a flexible tariff to protect the domestic mining industry when prices drop. Felix E. Wormser, vice-president, St. Joseph Lead Co., called for tariff adjustment to compensate for depreciated foreign currencies, and R. A. Young, vice-president, American Zinc Co. of Illinois, Dumas, Texas, declared that more mines must be brought into production in order that the zinc smelt-

ers of the country may be operated at capacity.

As Gold and Silver Banquet guest speaker, Otto Herres gave an excellent portrayal of the present Defense Minerals Administration organization and of the plans and hopes of that agency. The "sowbelly dinner" guest speaker was Rep. Clair Engle of California, who sharply criticized the Government's minerals program. Calling for freedom from red tape production premiums and matching of funds for exploration and development, he declared that under such a course, domestic mining will have the assured market, the price levels, and the available financing to go to work.

Coal Mine Reopens

It has been announced that the Engleville coal mine near Trinidad, Colo., would be reopened soon. The announcement was made by the Guadagnoli Brothers of Trinidad, who have leased the mine from the Colorado Fuel & Iron Co. The mine, located south of Trinidad, is one of the oldest coal producers in Las Animas county. The brothers plan to clean out the old workings, build a tipple, install machinery and begin operations with a crew of about 15 miners. The probable output was placed at 150 tons daily. The mine has been closed for some time. Preliminary work has already started.

New Park to Expand

The New Park Mining Co. has made application to the federal government for assistance to initiate an exploration and development program at its Park City properties, W. H. H. Cranmer, president, has announced. The funds if obtained would be used for three projects:

a. Extension of the Mayflower tunnel west from the present ore body and below the Star of Utah tunnel. The company would raise from the Mayflower into Wasatch lime beds common to Park Utah and New Park properties.
b. Crosscutting north on the Mayflower tunnel level to cut the parallel fissures. The cross cut would start opposite the ore body now being mined and extend about 1500 ft to the limits of company property.
c. Crosscutting south on the Mayflower tunnel level from a point a short distance beyond the ore body now being mined and would be driven to the limits of New Park property, approximately 2000 ft.

During World War II, the company was forced to neglect development work to turn all efforts to ore production. After the war, metal prices dropped, leaving little money available for such a program.

1951 Metal Mining Convention

Los Angeles, October 22-24

Harvey S. Mudd

Ross D. Leisk

PLANS for the 1951 Metal Mining Convention of the American Mining Congress, to be held in Los Angeles October 22-24, are getting well under way, under the general direction of Harvey S. Mudd. Mr. Mudd, widely known mining engineer and executive, officer and director of numerous mining and industrial companies, was elected Chairman of the Western Division of the American Mining Congress at the Salt Lake City meeting last August. Committees on arrangements, trips, etc., will be appointed shortly.

Ross D. Leisk, General Manager of Sunshine Mining Co., Kellogg, Idaho, has accepted the post of general chairman of the Program Committee. In this capacity he will head up the activities of a nationwide committee in developing a program for the Los Angeles meeting. With the increasing emphasis on metals and minerals as the backbone of the defense effort, unusual importance attaches to this year's Convention, and the program will be largely concerned with mining's role in the present emergency.

The last Mining Congress meeting in Los Angeles, in 1938, was a real success and the 1951 meeting will undoubtedly draw a heavy attendance. The Biltmore has agreed to supply a liberal quota of rooms, with additional accommodations available at Los Angeles' other well known hotels. Requests for accommodations should be sent directly to the hotels and those planning to attend are urged to send their reservations in as early as possible.

Barite Deposit Developed

Baroid Sales Division of National Lead Co. is developing barite deposits near El Portal, Calif., in a region with a history of 70 years of intermittent production. Diamond drilling has disclosed three parallel veins and one orebody, with a substantial tonnage of excellent grade barite reported blocked out.

Tonopah District Shaft

Exploration of silver-gold claims a half-mile south of Tonopah, Nev., has been started by the Trader Horn Mines Co., of Spokane, operators of lead-zinc properties in the state of Washington. Sinking of an exploratory shaft was begun as soon as a compressor, gasoline hoist and other units were installed. Sinking of the 100-ft shaft is progressing at the Divide Summit property. The shaft will explore geological conditions and formations indicated by a geophysical survey, and will be sunk deeper if favorable ore showings are found. An active mining program is contemplated next year if preliminary exploration proves encouraging. The shaft is the first to be put down in the Tonopah area in many years. V. J. Grismer is in charge of operations and Wm. Hawkins is directing shaft sinking.

New Park is also preparing a program for presentation to federal officials under which it would seek further assistance in exploration on the properties of East Utah Mining Co., of which it has voting control. Plans are to explore the McHenry fissure, which has been productive of the Park Utah ore body and also is the fissure in which Park Utah has discovered a new ore body near the Ontario shaft.

Expect Uranium Rush

A 289,500 acre portion of the Joshua Tree National Monument in Riverside and San Bernardino Counties, Calif., has been opened to mining. A rush of uranium prospectors is expected to descend on the region. An area of 535,840 acres is still restricted.

Copper Canyon Mills Ore

Copper Canyon Mining Co. is reported milling more than 25 tons of of lead-silver-zinc ore daily at its Copper Canyon mine, near Battle Mountain, Nev., with the bulk of the tonnage mined from the Hornsfel ore body on the 700-ft level of the Julie shaft. The concentrating plant, which has a capacity approximating 350 tons of ore daily, is understood to be treating copper ore produced by leasers from the company's adjacent mines.

New AEC Bonus and Price Schedule Announced

THE U. S. Atomic Energy Commission has acted to provide a new bonus for domestic uranium ore production and a price increase for Colorado Plateau ores as substantial additional incentives for uranium mining in the United States. The price raise will also enable Colorado Plateau miners to meet increases in the cost of mining which have occurred since the Commission's domestic ore buying schedules were established in 1948.

(1) Effective March 1, 1951, to March 1, 1954, the Commission will pay a new graduated bonus of up to $35,000, depending upon the quantity and grade of ore, for initial production and delivery of acceptable uranium ore from new and certain existing mining properties.

(2) Effective March 1, 1951, to April 1, 1958, the Commission will increase its guaranteed minimum base prices for the uranium oxide content of carnotite-roscoelite type ores of the Colorado Plateau from its present range of 50 cents-$2 per lb to $1.50-$3.50, depending upon grade of ore.

The New Bonus

The new bonus, which is described in AEC Domestic Uranium Program Circular No. 6, "Bonus for Initial Production of Uranium Ore from Domestic Mining Properties," to be issued shortly, provides:

(1) For new mining properties, bonus payments will be made on each pound of uranium oxide in acceptable ore delivered to qualified mills or Commission ore-buying stations up to and including the first 10,000 lb.

(2) For mining properties which have produced less than 10,000 lb of uranium oxide during the period April 9, 1948, to March 1, 1951, bonus payments will be made on the difference between what the mining property has delivered between April 9, 1948, and March 1, 1951, and 10,000 lb. For example, the owner of a mine that has produced 4,000 lb of uranium oxide between April 9, 1948, and March 1, 1951, may be eligible to receive a bonus on each new pound produced up to and including the next 6,000 lb.

(3) Bonus payments per lb of uranium oxide in acceptable ores produced from qualified mining properties will range from $1.50 for those ores assaying 0.10 percent uranium oxide to $3.50 for ores assaying 0.20 percent or more. Thus the maximum bonus which may be obtained for production from new mines will range from $15,000 to $35,000, depending upon the grade of ore.

Payments under the new bonus plan will be made for all eligible ores purchased after March 1, 1951. Payments will be made directly by the Commission and not by the receiving station or mill, and will be in addition to purchase payments made pursuant to ore buying schedules. Before bonus payments will be made, the producer must make application to the Commission and the Commission must certify that the mine is eligible for the bonus.

Because of the time required to set up the administrative machinery, bonus payments may not commence before May 1, but ores from qualified mines delivered and sold on and after March 1 will be eligible for bonus payments irrespective of the date of certification by the Commission.

The New Price Schedule

The new schedule of guaranteed minimum prices for the carnotite-roscoelite-type ores of the Colorado Plateau will increase the base price paid for uranium ores containing as little as 0.10 percent uranium oxide from 50 cents per lb to $1.50 per lb, and for ores containing 0.20 percent uranium oxide or more from $2 per lb to $3.50. In addition, the premium paid on ores containing more than 4 lb of uranium oxide to the ton will be increased from 25 cents to 75 cents per lb.

The new price schedule is as follows:

Uranium Oxide (U_3O_8) Assay Less than 0.10 percent	Bonus per lb No	Payment of U_3O_8 payment
0.10 percent		$1.50
0.11 "		1.70
0.12 "		1.90
0.13 "		2.10
0.14 "		2.30
0.15 "		2.50
0.16 "		2.70
0.17 "		2.90
0.18 "		3.10
0.19 "		3.30
0.20 " and more		3.50

The official circulars describing the bonus and price increases will be distributed soon to Commission ore-buying stations and will be made available to the mining industry.

Cobalt Refinery Ready for Machinery

The building to house the new cobalt refinery of the Howe Sound Co. near Garfield, Utah, has been completed and is ready for installation of machinery. The main building is 100 by 129 ft and 42 ft high. There will also be laboratory and office structures. The refinery has been planned to process 600 tons of cobalt concentrates daily from the Blackbird mine at Forney, Idaho. A new concentration process had to be developed before the refinery could be built.

Manufacturers Forum

Belt With Teeth

United States Rubber Co. has started large scale production of a rubber and fabric belt with teeth which it considers the most outstanding advance in power transmission during the past 50 years.

Known as the Gilmer Timing Belt, it is said to fulfill the need for a power drive which will not slip and permit split-second precision timing. In addition, it will attain speeds up to 16,000 ft per minute, and operate more quietly than precision gears running in an oil bath.

The manufacturer claims, in addition to its anti-slip characteristic and precision timing, the new belt will not stretch; it will operate on fixed centers without take-up adjustments, and since it needs no initial tension it has unusually high efficiency with extremely low bearing pressure. It requires no lubrication. However, oil will not harm it. It is unusually compact and speed ratios up to 30:1 are possible with it. Extreme flexibility permits pulley diameters as small as one-half inch at 10,000 rpm even with a heavy load.

Low maintenance costs are reported because of the absence of take-up mechanisms, elimination of lubrication, and power waste. Moreover, the initial cost of the belt may be lower than other types of drives because of smaller drive constructions.

Demand Oxygen Unit Introduced By M-S-A

A new demand-type oxygen unit for emergency treatment of smoke inhalation, heart failure, asthma, pneumonia and carbon monoxide inhalation has been developed by Mine Safety Appliances Co.

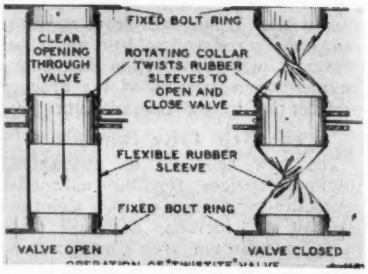
Completely self-contained in a sturdy carrying case, the M-S-A Demand Oxygen Unit is put in operation merely by opening the cylinder valve and placing the facepiece on the patient. Oxygen is administered automatically as the patient's breathing requires it. This instrument also can be used to supply oxygen in conjunction with artificial respiration in cases of asphyxia.

The complete unit consists of a half-mask facepiece, regulator assembly, six ft of non-kinking breathing hose, a 40 cu ft capacity oxygen cylinder and the carrying case.

For a copy of new Bulletin CW-5 describing the M-S-A Demand Oxygen Unit, write to Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8, Pa.

"Twistite" Double-Closure Bin Valve

The "Twistite" double-closure bin valve, recently announced by Stephens-Adamson Mfg. Co., is described as consisting of two rubber sleeves joined by a rotating steel collar. Dust and drip-tight closure is obtained by pulling on a cable wrapped around the rotating collar, sealing the opening with a twist in each of the rubber sleeves. The valve is self-opening, the elasticity of the rubber sleeves causing them to resume their cylindrical shape immediately when tension on the cable is released. Since the flexible rubber sleeves can wrap themselves easily around lumps caught in the valve during closure, there is no danger of leakage due to variation in the size of material particles. The valve can be hand controlled locally by mounting a ratchet lock on the valve to hold the cable in the closed position. Remote hand control can be obtained by mounting the ratchet lock at any desired location and running the control cable to it by a simple pulley arrangement. The valve can also be controlled automatically by the use of a small actuating motor.



The standard 6-in. valve weighs 35

Portable Conveyor for Continuous Mining

Barber-Greene Co., of Aurora, Ill., have announced their newly developed Model 366 portable mine conveyor.

Furnished in 24-in. belt width and 20-ft lengths, units are mounted on two pneumatic tired wheels well balanced for "man-handling." The overall height at the point of discharge is

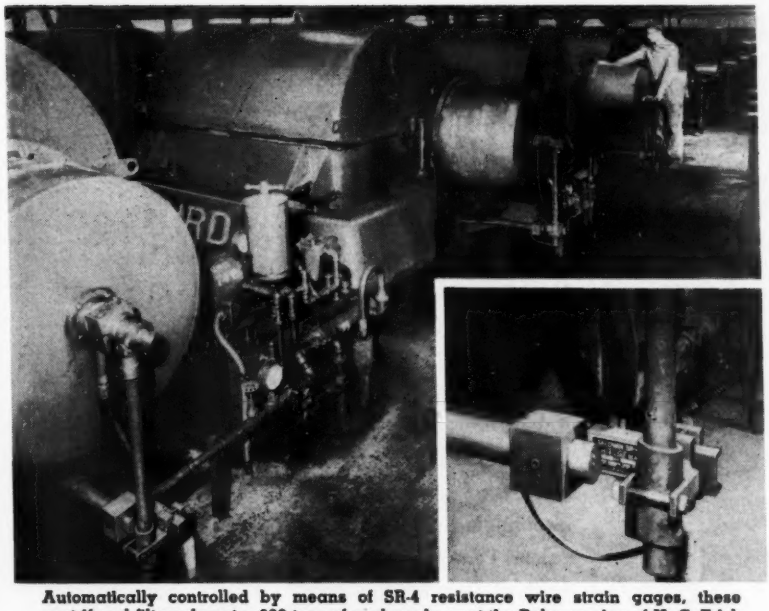
under 24-in., weight is 1600 lbs. The conveyor is furnished with a rugged, simple right angle drive which includes a permissible 3 hp electric motor, junction box and control, the manufacturer says.

Since as many as 12 or 15 conveyors can be operated in series, each discharging onto the other, an advantage claimed for the new design is a master control which starts or stops all units at once. Further, if one unit stops or if connecting cables are separated, the entire series is halted until the trouble is corrected.

A combination skirt board and flexible rubber flashing is said to permit deeper troughing, hence greater carrying capacity, less spillage and more practical transfer from one unit to another.

With B-G portable conveying equipment it is also possible to have a main gathering conveyor in one room served from rooms on either side by placing portables in breakthroughs from the other rooms. Portables can also be used in a straight series from the mining machine to shuttle cars or to a gathering conveyor.

Although specifically designed for the requirements of continuous mining, the new portable conveyor series can be adapted to conventional mining if the lump size is not excessive.



Automatically controlled by means of SR-4 resistance wire strain gages, these centrifugal filters dewater 300 tons of coal per hour at the Robena mine of H. C. Frick Coke Co. Arms extending down from the shaft of the machines through clevises clamped to cantilever Load-Beams on which SR-4 gages are bonded, push the beam in accordance with loading conditions, thus affecting the electrical resistance of the gages. Baldwin SR-4 Load-Beams, shown in detail at lower right, are mounted on brackets extending out from the bases of the machine

lbs with the ratchet cable-lock mounted on the valve frame. It will handle lump sizes up to 2½ in. and requires a 30-lb cable pull for closure. Sheet 254-A gives full information and can be obtained by writing directly to Stephens-Adamson Mfg. Co. at Aurora, Ill.; Los Angeles, Calif., or Belleville, Ontario, Canada.

New Blast-Hole Drill for Strip Mines

The Joy Manufacturing Co., Henry W. Oliver Building, Pittsburgh 22, Pa., announces the Joy Champion, a new type of blast-hole drill for strip-mines. Using the exclusive principle of rotary air-blast drilling, a Joy development, the Champion is said to be equivalent in capacity to three or more churn drills. It is operated by two men.

In addition to its higher drilling speed, the Champion is said to offer several other advantages. The hole drilled is perfectly straight and smooth-sided, permitting larger powder-charges per hole diameter. The rigidity of the drilling stem prevents bit "wander" and insures the completion of every hole started. Cracks, fissures, clay seams, or loose rock do not deflect or stop the Champion. Since no water is required, the drill is an all-weather machine.

Rotary air-blast drilling is a combination of two processes: It utilizes a tri-cone roller bit of the oil-field type which continuously pressure-cuts the rock, and it utilizes a blast of compressed air to remove cuttings and cool the bit. A prime factor in the high drilling-speed is the instantaneous removal of the cuttings. The bit, therefore, is always attacking virgin rock. Cuttings are automatically collected and piled beside the machine, where they are handy for stemming.

Plastic Pipe

A plastic pipe in threaded sections featuring extreme light weight has been developed by Carlon Products Corp., Cleveland 5. The Carlon "TL" pipe is available in 20-ft lengths and incorporates standard International pipe threads. The pipe may be threaded and cut in the conventional manner with standard pipe-fitting tools. Standard pipe diameters from ¼-2 in. are available.

— *Announcements* —

The merging of the Cocoon engineering division of the **R. M. Hollingshead Corp.** with the company's industrial-aviation division has just been announced by officials of the Camden, N. J., chemical firm. Sales of Whiz Cocoon will now come under the marketing policies of the industrial-aviation division which is headed by **Fred H. Lee**, sales manager.

The Cocoon enginering division was formerly headed by **Joseph P. Hynes** whose resigation from the firm was also announced by Hollingshead Corp. officials.

It is said special emphasis will be placed on use of the product in coal mines where recently developed techniques of applying Cocoon are resulting in new conception of mine ventilation and safety.

Roberts & Schaefer Co. announces the appointment of **Laning Dress** as an assistant to **John E. Kalinka**, executive vice-president in charge of engineering, construction and operation in connection with execution of contracts. Mr. Dress, a mechanical engineer of Bucknell University, has been for the past five years preparation engineer for Binkley Coal Co., Chicago.

Elliott Harrington has been appointed vice-chairman and secretary of a newly-established Defense Projects and Priorities Committee of **General Electric's** small and medium motor divisions. Mr. Harrington's former duties as manager of the induction motor sales division will be assumed by **R. S. Walsh.**

William A. Roberts, executive vice-president in charge of the tractor division, **Allis-Chalmers Mfg. Co.**, was recently elected president of that company. Mr. Roberts succeeds the late Walter Geist.

Four new vice-presidents were also elected at the same time. **W. C. Johnson**, formerly executive vice-president in charge of the general machinery division, was named executive vice-president for the entire company. **J. L. Singleton**, formerly vice-president and director of sales, general machinery division, was named vice-president in charge of the general machinery division. **Fred Mackey**, formerly general manager, general machinery division, was named vice-president in charge of manufacturing of that division. **R. S. Stevenson**, formerly general sales manager, tractor division, was named vice-president in charge of the tractor division. **A. W. Van Hercke**, formerly director of engineering, tractor division, was named vice-president in charge of engineering, tractor division. **John Ernst**, formerly general works manager, tractor division, was named vice-president in charge of manufacturing, tractor division.

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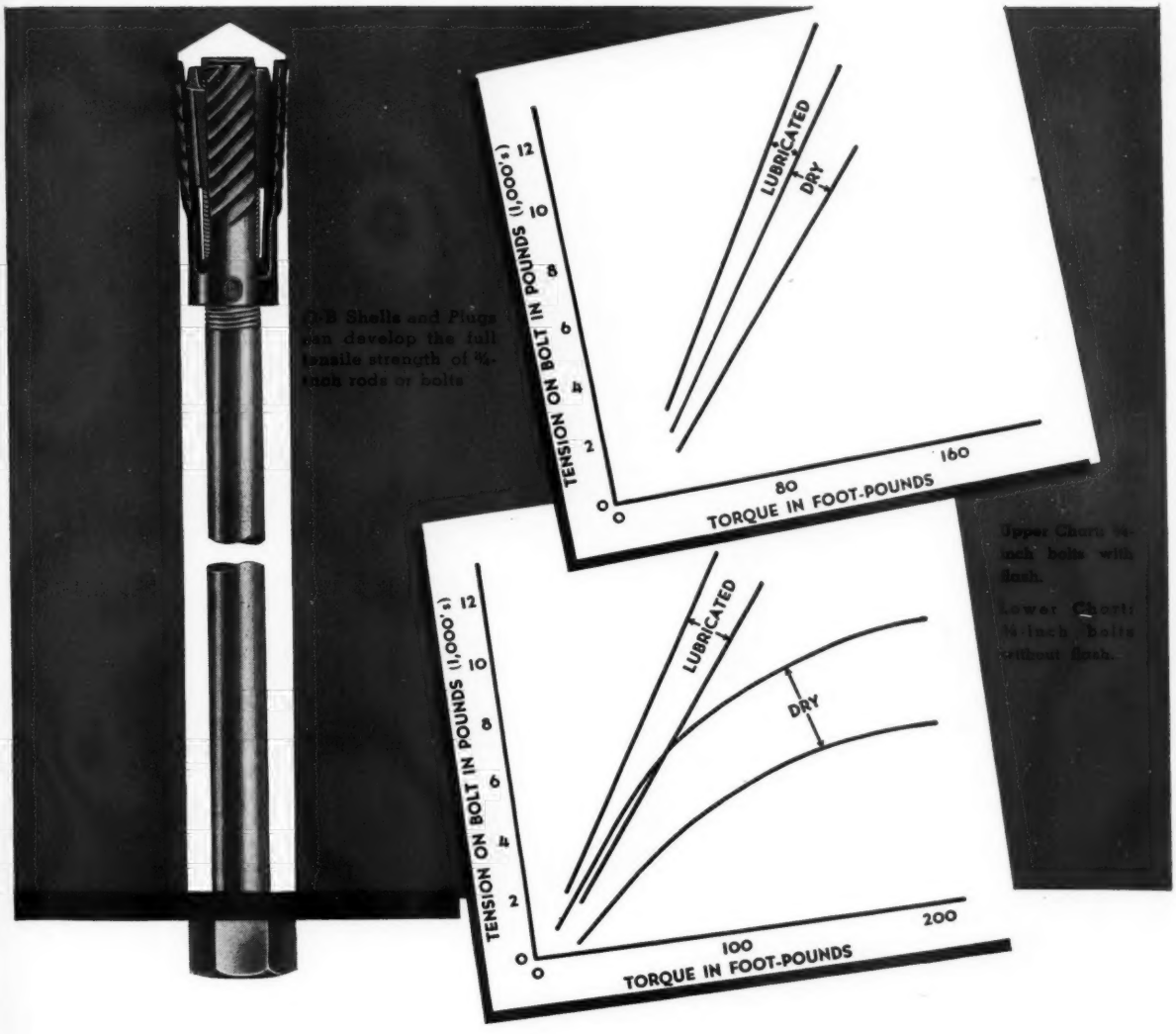

Learn More About Roof Bolting Methods

These charts are typical of the information Ohio Brass has gathered for your use in establishing roof bolting programs in your mines. There's no need to proceed by guesswork when this information can be had for the asking. Various O-B publications discuss the variables of torque, bolt tension, hole size and lubrication. This information was gathered by Ohio Brass from the field and laboratory for two important reasons: First, to guide the design and use of O-B Roof Support Expansion Shells and Plugs; and second, to provide useful, tested information for operators using bolting for roof support. Write for publications dealing with the subjects mentioned.

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The engineering refinements and service benefits of Edison R Lamps come as *plus* values to the basic function. Because both equi ment and service structure are designed from an intimate knowled of overall mining problems, gained in years of close cooperati with the mining field, there's something about the R-4 Lamp th EVERYBODY likes . . .

PRESIDENT: "Our lamp costs under MSA's rental plan are not only reasonable . . . but they're *stable.* That's about the only item in our whole cost picture that we can be sure won't change."

SUPERINTENDENT: "The regular visits of the MSA man means trouble free and dependable light and service."

FOREMAN: "With Edison Lamps, a burned-out filament doesn't mean a lost shift for a man and a short crew for me. Edison's double filament bulb saves us hundreds of man-hours every year."

MAINTENANCE: "Edison equipment makes my job easier. Lamps are easy to service, and batteries last for years. And the MSA training course taught me how best to handle lamps and get the most out of them."

MINER: "My job, my production and my safety all depend on my light. I want equipment I can bank on . . . and I know that Edison lamps will always deliver."

ENGINEER: "We always want to include every possible improvement in any new lamp house . . . and the MSA man always makes an important contribution. He knows the ideas that work . . . and the ones that don't!"

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